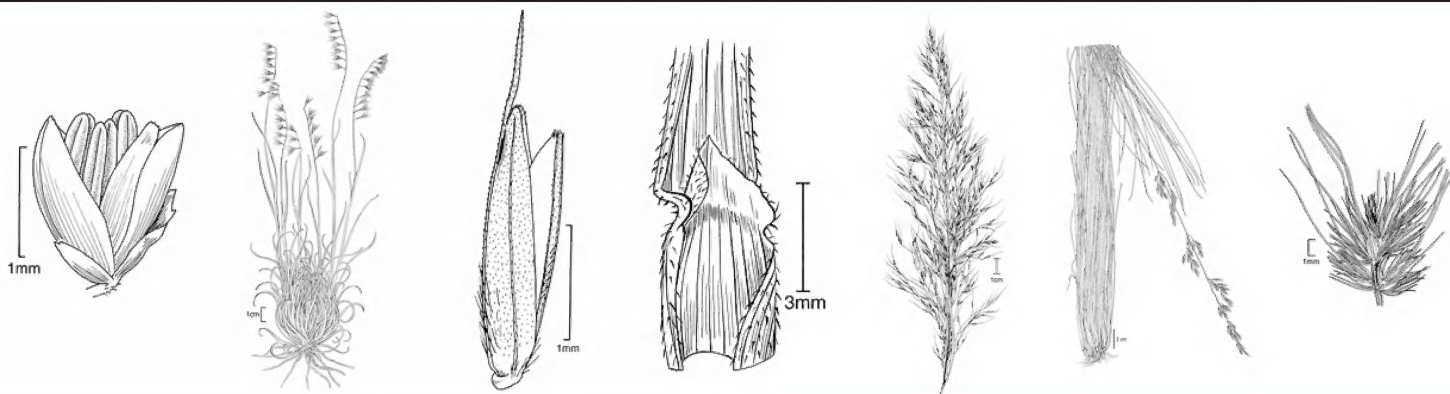




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# Grasses of Chihuahua, Mexico

*Yolanda Herrera Arrieta*  
and  
*Paul M. Peterson*

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WASHINGTON, D.C.

2018

## ABSTRACT

Herrera Arrieta, Yolanda, and Paul M. Peterson. Grasses of Chihuahua, Mexico. *Smithsonian Contributions to Botany*, number 107, x + 380 pages, 246 figures, 1 table, 2018.—Our revision of the grasses of Chihuahua includes 385 species in 95 genera, 15 subspecies, 29 varieties, and 4 forms. We provide keys for determination, detailed descriptions, nomenclatural synonyms, ecological information on habitat, distribution based on herbarium specimens, and illustrations for 251 species and 8 varieties. We provide a new combination for *Cenchrus polystachios* subsp. *setosus*.

## RESUMEN

Herrera Arrieta, Yolanda, and Paul M. Peterson. Grasses of Chihuahua, México. *Smithsonian Contributions to Botany*, número 107, x + 380 páginas, 246 figuras, 1 tabla, 2018.—Nuestra revisión de las gramíneas de Chihuahua incluye 385 especies en 95 géneros, 15 subespecies, 29 variedades y 4 formas. Se proveen claves para su determinación, descripciones detalladas, sinónimos nomenclaturales, información ecológica del hábitat, distribución con base en ejemplares de herbario e ilustraciones de 251 especies y 8 variedades. Proporcionamos una nueva combinación para *Cenchrus polystachios* subsp. *setosus*.



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DE CIENCIA  
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Cover images, from left to right: *Sporobolus spiciformis* spikelet (Figure 235C); *Muhlenbergia tarahumara* habit (Figure 178A); *M. longiligula* floret (Figure 162H); *Poa matri-occidentalis* subsp. *mohinorensis* ligule (Figure 207D); *M. rigida* inflorescence (Figure 170C); *Festuca tolucensis* stylized growth form (Figure 124B); *M. pereilema* portion of inflorescence (Figure 167G).

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# Grasses of Chihuahua, Mexico

Yolanda Herrera Arrieta<sup>1</sup> and Paul M. Peterson<sup>2\*</sup>

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## INTRODUCTION

Chihuahua is the largest state in Mexico, occupying 12.6% of the total area, and is bounded by the meridians 31.78333° and 25.63333° north and 103.30000° and 109.11667° west. Chihuahua is divided into 67 municipios [municipalities] (Figure 1, Table 1). The state includes portions of three natural ecoregions: the Sierra Madre Occidental (SMO) pine-oak woodlands, which contain extensive grasslands; the Chihuahuan Desert grassland, which is considered a center of origin and diversification for plant and animal species; and a smaller area west of the SMO called the Sonoran-Sinaloan transition subtropical dry forests (LeSueur, 1945; Olson et al., 2001). The SMO and Chihuahuan Desert regions include species that have both northern and southern affinities whereas the Sonoran-Sinaloan transition subtropical forests are represented by species with primarily southern neotropical affinities (Axelrod, 1979; Rzedowski, 1993).

Twenty-one herbaria were visited and specimens were verified before inclusion in the Specimens Examined sections. Specimen data provided in these sections are reproduced from specimen labels. The herbaria abbreviations are as follows:

ANSM	Universidad Autónoma Agraria Antonio Narro, Saltillo, Mexico
ARIZ	University of Arizona, Tucson, Arizona, USA
CAN	Canadian Museum of Nature, Ottawa, Ontario, Canada
CAS	California Academy of Sciences, San Francisco, California, USA
CHAPA	Colegio de Posgraduados, Chapingo, Mexico
CIIDIR	Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional, Instituto Politécnico Nacional, Durango, Mexico
ENCB	Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, Mexico City, Distrito Federal, Mexico
IBUG	Universidad de Guadalajara, Jalisco, Mexico
INEGI	Instituto Nacional de Estadística y Geografía, Aguascalientes, Mexico
NMC	New Mexico State University, Las Cruces, New Mexico, USA
MEXU	Universidad Nacional Autónoma de México, Mexico City, Distrito Federal, Mexico
MO	Missouri Botanical Garden, St. Louis, Missouri, USA
RELC	Rancho Experimental La Campana, INIFAP-SAGAR, Chihuahua, Mexico
RSA	Rancho Santa Ana Botanic Garden, Claremont, California, USA
SLPM	Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico
TAES	S. M. Tracy Herbarium, Texas A & M University, College Station, Texas, USA
TEX	University of Texas at Austin, Austin, Texas, USA
UACH	Universidad Autónoma de Chihuahua, Chihuahua, Mexico
UACJ	Universidad Autónoma de Ciudad Juárez, Ciudad Juárez, Chihuahua, Mexico

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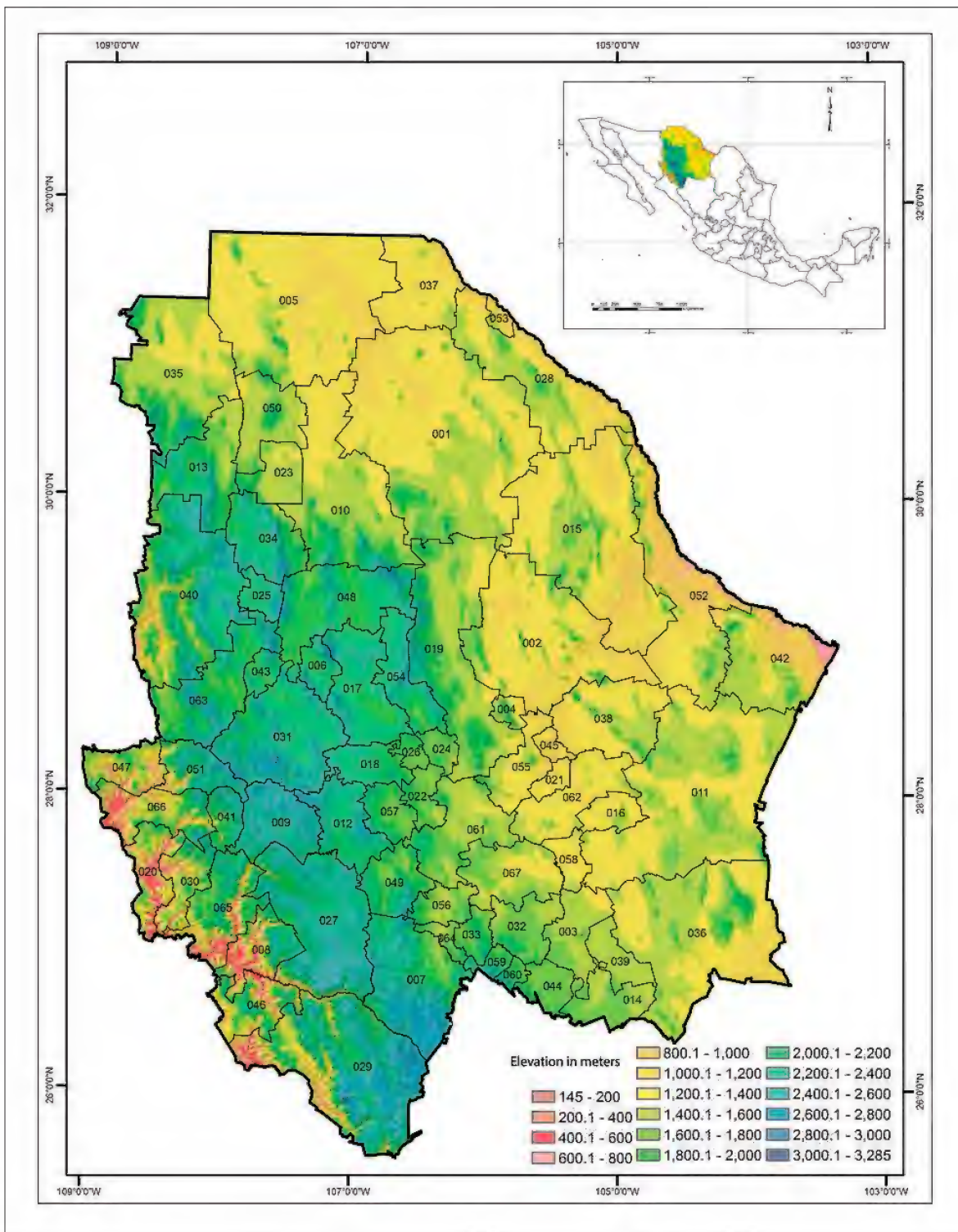


FIGURE 1. Location of Municipios in Chihuahua, Mexico. Municipio number is given in Table 1; color as indicated in legend represents elevation in meters. Map provided by Y. Herrera-Arrieta.



TABLE 1. Municipios [municipalities] of Chihuahua.

Number for municipio	Municipio	Number for municipio	Municipio
001	Ahumada	035	Janos
002	Aldama	036	Jiménez
003	Allende	037	Juárez
004	Aquiles Serdán	038	Julimes
005	Ascensión	039	López
006	Bachíniva	040	Madera
007	Balleza	041	Maguarichi
008	Batopilas	042	Manuel Benavides
009	Bocoyna	043	Matachí
010	Buenaventura	044	Matamoros
011	Camargo	045	Meoqui
012	Carichí	046	Morelos
013	Casas Grandes	047	Moris
014	Coronado	048	Namiquipa
015	Coyame del Sotol	049	Nonoava
016	La Cruz	050	Nuevo Casas Grandes
017	Cuahtémoc	051	Ocampo
018	Cusihiuriachi	052	Ojinaga
019	Chihuahua	053	Praxedis G. Guerrero
020	Chínipas	054	Riva Palacio
021	Delicias	055	Rosales
022	Belisario Domínguez	056	Rosario
023	Galeana	057	San Francisco de Borja
024	Santa Isabel	058	San Francisco de Conchos
025	Gómez Farías	059	San Francisco del Oro
026	Gran Morelos	060	Santa Bárbara
027	Guachochi	061	Satevó
028	Guadalupe	062	Saucillo
029	Guadalupe y Calvo	063	Temósachic
030	Guazapares	064	El Tule
031	Guerrero	065	Urique
032	Hidalgo del Parral	066	Uruachi
033	Huejotitán	067	Valle de Zaragoza
034	Ignacio Zaragoza		

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US	United States National Herbarium, National Museum of Natural History, Smithsonian Institution, Washington D.C., USA

For the grasses of Cascada de Basaseachi and adjacent areas, Spellenberg et al. (1996) lists 85 grass species of which 25 now occur in *Muhlenbergia* Schreb. Lebgue and Valerio (1986) included 291 grass species for Chihuahua of which 51 now occur in *Muhlenbergia*. Valdés Reyna (1977) included 314 grass species in 87 genera for Chihuahua of which 59 species now occur in *Muhlenbergia*. Our current treatment includes 385 grass species for Chihuahua of which 78 occur in *Muhlenbergia*. *Muhlenbergia* is the most diverse grass genus in Mexico, and its center of diversity lies within the state of Chihuahua. This is perhaps a reflection of the number of different habitats that are found in the state and the adaptive ability of the *Muhlenbergia* to colonize these habitats.

The following 68 grasses (17.7% of total) are introduced in Chihuahua (marked with an asterisk [\*] within the description): *Agropyron cristatum*, *Agrostis stolonifera* var. *palustris*, *Alopecurus geniculatus*, *Anthoxanthum odoratum*, *Arundo donax*, *Avena fatua*, *A. sativa*, *Bromus catharticus*, *B. japonicus*, *B. tectorum*, *Cenchrus americanus*, *C. ciliaris*, *C. clandestinus*, *C. echinatus*, *C. polystachios*, *Chloris gayana*, *Cortaderia selloana*, *Cynodon dactylon*, *Dactylis glomerata*, *Dactyloctenium aegyptium*, *Dichanthium annulatum*, *Digitaria sanguinalis*, *Echinochloa colona*, *E. crus-galli*, *Eleusine indica*, *E. multiflora*, *Elymus repens*, *Eragrostis barrelieri*, *E. cilianensis*, *E. ciliaris*, *E. curvula*, *E. echinochloidea*, *E. lehmanniana*, *E. pilosa*, *E. superba*, *Eriochloa contracta*, *Festuca myuros*, *Hackelochloa granularis*, *Heteropogon contortus*, *H. melanocarpus*, *Holcus lanatus*, *Hordeum murinum*, *H. vulgare*, *Lolium arundinaceum*, *L. multiflorum*, *L. perenne*, *Melinis repens*, *Panicum antidotale*, *P. dichotomiflorum*, *Phalaris aquatica*, *P. canariensis*, *P. paradoxa*, *Poa annua*, *Polypogon monspeliensis*, *P. viridis*, *Schismus arabicus*, *S. barbatus*, *Setaria adhaerens*, *S. pumila*, *S. verticillata*, *S. viridis*, *Sorghum bicolor*, *S. halepense*, *Stenotaphrum secundatum*, *Thinopyrum intermedium*, *Tragus berteronianus*, *Triticum aestivum*, and *Urochloa plantaginea*.

The following 17 species are cultivated as food for humans (+) or livestock (++) or as ornamentals (+++): *Avena sativa* (+, ++), *Bouteloua curtipendula* (++) , *B. gracilis* (++) , *Cenchrus ciliaris* (++) , *C. clandestinus* (+++), *Cortaderia selloana* (+++), *Disakisperma dubium* (++) , *Eragrostis curvula* (++) , *E. superba* (++) , *Hordeum vulgare* (+, ++), *Lolium multiflorum* (++) , *L. perenne* (++) , *Panicum virgatum* (++) , *Phalaris canariensis* (++) , *Sorghum bicolor* (++) , *Triticum aestivum* (+), and *Zea mays* subsp. *mays* (+, ++) (Esqueda Coronado et al., 2005; Saenz Flores et al., 2015).

There are six endemic grass species and one subspecies known only from Chihuahua: *Bouteloua chihuahuana*, *Festuca dichlina*, *Muhlenbergia argentea*, *M. decumbens*, *M. majalcensis*, *Poa matri-occidentalis* subsp. *mohinorensis*, and *Triniochloa laxa*.

With the infusion of molecular data, the present concept and classification of the grasses is changing at a rapid rate. We follow the grass classification presented in Soreng et al. (2017a, 2017b) and Peterson et al. (2014a, 2016, 2017), which consists

of  $\pm 11,506$  species in 768 genera found in 12 subfamilies, 52 tribes, and 94 subtribes. Below we provide a synopsis of the classification for all grass genera that occur in Chihuahua.

#### SYNOPSIS

The following list is a synopsis of the classification of the genera into subfamily, tribe, and subtribe for the grasses of Chihuahua, Mexico.

- subfamily Aristidoideae
  - tribe Aristideae: *Aristida*
- subfamily Arundinoideae
  - tribe Arundineae: *Arundo*
  - tribe Molinieae: *Phragmites*
- subfamily Bambusoideae
  - tribe Bambuseae
    - subtribe Guaduinae: *Otatea*
- subfamily Chloridoideae
  - tribe Cynodonteae
    - subtribe Boutelouinae: *Bouteloua*
    - subtribe Dactylocteninae: *Dactyloctenium*
    - subtribe Eleusinae: *Chloris*, *Cynodon*, *Dinebra*, *Diplachne*, *Disakisperma*, *Eleusine*, *Leptochloa*
    - subtribe Gouiniinae: *Tridentopsis*
    - subtribe Hilariinae: *Hilaria*
    - subtribe Kaliniinae: *Kalinia*
    - subtribe Monanthochloinae: *Distichlis*
    - subtribe Muhlenbergiinae: *Muhlenbergia*
    - subtribe Pappophorinae: *Pappophorum*, *Tridens*
    - subtribe Scleropogoninae: *Dasyochloa*, *Blepharidachne*, *Erioneuron*, *Munroa*, *Scleropogon*
    - subtribe Traginae: *Tragus*
  - tribe Eragrostidaeae
    - subtribe Cotteinae: *Cottea*, *Enneapogon*
    - subtribe Eragrostidinae: *Eragrostis*
  - tribe Zoysieae
    - subtribe Sporobolinae: *Sporobolus*
- subfamily Danthonioideae
  - tribe Danthonieae: *Cortaderia*, *Schismus*
- subfamily Oryzoideae
  - tribe Oryzeae
    - subtribe Oryzinae: *Leersia*
    - subtribe Zizaniinae: *Luziola*
- subfamily Panicoideae
  - tribe Andropogoneae
    - subtribe Andropogoninae: *Andropogon*, *Bothriochloa*, *Dichanthium*, *Heteropogon*, *Schizachyrium*
    - subtribe Rottboelliinae: *Hackelochloa*
    - subtribe Saccharinae: *Imperata*, *Sorghastrum*, *Sorghum*, *Trachypogon*

- subtribe Tripsacinae: *Elionurus*, *Tripsacum*, *Zea*
- tribe Paniceae
  - subtribe Anthephorinae: *Digitaria*
  - subtribe Boivinellinae: *Echinochloa*, *Lasiacis*, *Oplismenus*
  - subtribe Cenchrinae: *Cenchrus*, *Setaria*, *Setariopsis*, *Stenotaphrum*, *Zuloagaea*
  - subtribe Melinidinae: *Chaetium*, *Eriochloa*, *Melinis*, *Urochloa*
  - subtribe Panicinae: *Panicum*
- tribe Paspaleae
  - subtribe Paspalinae: *Hopia*, *Paspalum*
- subfamily Poioideae
  - tribe Bromeae: *Bromus*
  - tribe Meliceae: *Glyceria*, *Melica*, *Trinichloa*
  - tribe Poeae
    - subtribe Agrostidinae: *Agrostis*, *Calamagrostis*, *Polypogon*
    - subtribe Airinae: *Avenella*
    - subtribe Alopecurinae: *Alopecurus*
    - subtribe Anthoxanthinae: *Anthoxanthum*
    - subtribe Aristaveninae: *Deschampsia*
    - subtribe Aveninae: *Avena*, *Koeleria*, *Peyritschia*, *Sphenopholis*, *Trisetum*
    - subtribe Dactylidinae: *Dactylis*
    - subtribe Holcinae: *Holcus*
    - subtribe Loliinae: *Festuca*, *Lolium*
    - subtribe Phalaridinae: *Phalaris*
    - subtribe Poinae: *Poa*
  - tribe Stipeae: *Achnatherum*, *Hesperostipa*, *Nassella*, *Piptochaetium*
  - tribe Triticeae: *Aegilops*, *Agropyron*, *Elymus*, *Hordeum*, *Thinopyrum*, *Triticum*

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## FAMILY DESCRIPTION: POACEAE

**Annual** or perennial; usually terrestrial, sometimes aquatic; tufted, mat-forming, caespitose, pluricaespitose, or with solitary *culms* (flowering stems); rhizomes and stolons often well-developed. **Culms** annual or perennial, herbaceous or woody, usually erect or ascending, sometimes prostrate or decumbent for much of their length, occasionally climbing, rarely floating; **nodes** prominent, sometimes concealed by the sheaths; **internodes** hollow or solid, bases meristematic; **branching** from the basal nodes only or from the basal, middle, and upper nodes; **basal branching** extravaginal or intravaginal; **branching from the upper nodes** intravaginal, extravaginal, or infravaginal. **Leaves** alternate, 2-ranked, each composed of a sheath and blade encircling the culm or branch; **sheaths** usually open, sometimes closed, the margins fused for all or part of their length; **auricles** (lobes of tissue extending beyond the margins of the sheaths on either side) sometimes present; **ligules** usually present at the sheath-blade junction, particularly on the adaxial surface, abaxial ligules common in the *Bambusoideae*, membranous, sometimes ciliate, adaxial ligules usually present, of membranous to hyaline tissue, a line of hairs, or a ciliate membrane; **blades** usually linear to lanceolate, occasionally ovate to triangular, bases sometimes *pseudopetiolate* (having a petiole-like constriction), venation usually parallel, sometimes with evident cross veins,

occasionally divergent. **Inflorescences** (*synflorescences*) usually compound, composed of simple or complex aggregations of primary inflorescences, aggregations paniculate, spicate, or racemose or of spike-like branches, often with an evident *rachis* (central axis), primary inflorescences *spikelets*, *pseudospikelets*, or spikelet equivalents; **inflorescence branches** usually without obvious bracts. **Spikelets** with (0–1)2(3–6) *glumes* (empty bracts) subtending 1–60 florets, glumes and florets distichously attached to a *rachilla* (central axis); **pseudospikelets** with bud-subtending bracts below the glumes. **Glumes** usually with an odd number of veins, sometimes awned. **Florets** bisexual, staminate, or pistillate, usually composed of a *lemma* (lower bract) and *palea* (upper bract), lodicules, and reproductive organs, often laterally or dorsally compressed, sometimes round in cross section; **lemmas** usually with an odd number of veins, often awned, bases frequently thick and hard, forming a callus, backs rounded or keeled over the midvein, awns usually 1(3), arising basally to terminally; **paleas** usually with 2 major veins, with 0 to many additional veins between the major veins, sometimes also in the margins, often keeled over the major veins; **lodicules** (0)2–3, inconspicuous, usually without veins, bases swelling at anthesis; **stamens** usually 3, sometimes 1(2) or 6+, filaments capillary, anthers versatile, usually all alike within a floret, sometimes 1 or 2 evidently longer than the others; **ovaries** 1-loculed, with (1)2–3(4) styles or style branches, stigmatic region usually plumose. **Fruits** caryopsis, pericarp usually dry and adhering to the seed, sometimes fleshy or dry and separating from the seed at maturity or when moistened; **embryos**  $\frac{1}{2}$  as long as to almost equaling the caryopsis, highly differentiated with a *scutellum* (absorptive organ), a shoot with leaf primordium covered by the *coleoptile* (shoot sheath), and a root covered by the *coleorhiza* (root sheath); **hila** punctate to linear. Base chromosome number,  $x = 5, 6, 7, 9, 10, 11, 12$ .

## KEY TO THE GRASS GENERA OF CHIHUAHUA

1. Plants generally lignified; culms height 2 m or more.
  2. Culms solid or hard-walled and thick; nodes producing generally 3 branches; foliage leaves pseudopetiolate. . . . *Otatea*
  2. Culms hollow, thin-walled; nodes producing generally 2 branches; leaf blades narrow-linear, never pseudopetiolate.
    3. Inflorescence an ovoid panicle, diffuse, 10–30 cm long; spikelets 3–4.7 mm long, globose, with 2 florets, 1 fertile and 1 sterile . . . . . *Lasiacis*
    3. Inflorescence a plumose panicle, dense, 40–60 cm long; spikelets 10–15 mm long, compressed, with (2)3–9 fertile florets.
      4. Lemma pilose with spreading hairs that are long and silky; rachilla hairless; blades strongly cordate-auriculate basally . . . . . *Arundo*
      4. Lemma glabrous; rachilla pilose with long, silky hairs; blades narrow basally . . . . . *Phragmites*
1. Plants generally herbaceous; culms height less than 2 m, occasionally up to 4 m tall (in *Tripsacum*).
  5. Spikelets unisexual, staminate appreciably different from pistillate.
    6. Plants monoecious, staminate and pistillate spikelets in the same plant.
      7. Staminate and pistillate spikelets in the same inflorescence . . . . . *Tripsacum*
      7. Staminate and pistillate spikelets in separate inflorescences.
        8. Aquatic plants, submerged, floating leaves over water surface; plants 10–40 cm tall, perennial, stamens 6–8 . . . . . *Luziola*
        8. Terrestrial plants; plants 100–500 cm tall, annuals, stamens 3 . . . . . *Zea*

6. Plants dioecious, staminate and pistillate spikelets in separate plants.
  9. Key to pistillate plants.
    10. Lemmas and reduced florets of pistillate spikelets awnless.
      11. Pistillate spikelets surrounded by a "false involucre," formed by hardened glumes united at base; inflorescences not terminal and partially hidden by the sheath . . . . . *Bouteloua*
      11. Pistillate spikelets without a "false involucre"; inflorescences terminal . . . . . *Distichlis*
    10. Lemmas and reduced florets of pistillate spikelets conspicuously awned . . . . . *Scleropogon*
  9. Key to staminate plants.
    12. Inflorescence a pectinate spike, with spikelets inserted at the side of the rachis; glumes obtuse to short acuminate . . . . . *Bouteloua*
    12. Inflorescence not pectinate; glumes long acuminate to an acute or awned apex.
      13. Glumes and lemma strongly carinate, acute, the glumes  $\frac{2}{3}$  as long as basal lemma; leaves clearly distichously arranged . . . . . *Distichlis*
      13. Glumes and lemma not carinate, long acuminate, glumes almost as long as the basal lemmas, leaves not distichously arranged . . . . . *Scleropogon*
5. Spikelets usually perfect, or if unisexual, then staminate spikelets not very different from the pistillate.
  14. Spikelets involucrate, in groups of 2–3(5); sometimes (in *Hordeum*) lateral spikelets reduced to awns.
    15. Spikelets with thorns, or with an involucre of bristles or spines; awns absent.
      16. Upper glume of the lower spikelets equipped with hooked spines over the veins; involucre absent . . . . . *Tragus*
      16. Upper glume without spines; involucre present of spines or bristles . . . . . *Cenchrus*
    15. Spikelets without thorns and lacking an involucre of spines or bristles; awns usually present.
      17. Spikelets surrounded by "false involucres" composed of glumes united at base, the false involucre 4- to 6-lobed.
        18. Inflorescence with short-pedicelled spikes, partially included in the upper sheaths, or false involucres whitish, lacking glands; florets pistillate . . . . . *Bouteloua*
        18. Inflorescence a terminal, notably exserted spiciform raceme, often with blackish glands; florets perfect . . . . . *Hilaria*
      17. Spikelets without a "false involucre" composed of hardened glumes, united at base.
        19. Spikelets in capitate involucres, subsessile spikelets in "hardly leaved portions" of short plants (culms 3–10 cm), hidden by wide sheaths . . . . . *Munroa*
        19. Spikelets not in capitate involucres, inflorescences of another form, or if in involucres, then well-exserted.
          20. Spikelets densely crowded in symmetrical spikes, disposed at both sides of the rachis; lemmas usually with awns 1–3 cm long.
            21. Spikelets 3 per node, with 1 floret, the lateral ones pedicelled, usually reduced to awns; plants strictly annual . . . . . *Hordeum*
            21. Spikelets 1 to 3 per node, with 2 similar florets; plants perennial.
              22. Glumes and lemmas stiff and thick, indurate to coriaceous; lemmas mostly awnless or if awned, then the awns to 5 mm . . . . . *Thinopyrum*
              22. Glumes not so stiff and thick, lemmas awned, awns 10–40 mm (2–4[10] mm long in *E. repens*) . . . . . *Elymus*
    20. Spikelets crowded frequently on unilateral spikes or racemes, occasionally disposed on both sides of the rachis (but then the inflorescence loose); lemmas with awns less than 1 cm long, sometimes awnless.
      23. Inflorescence dimorphic; lateral spikelets staminate, 2-flowered, central spikelet 3-flowered; first floret perfect, short stipitate, the lateral florets staminate or sterile . . . . . *Bouteloua*
      23. Inflorescences monomorphic, spikelets all 1-flowered or 2- to 3(4)-flowered, the florets dimorphic.
        24. Spikelets 1-flowered, the central perfect, the laterals staminate or neutral; glumes oblong to oblong-obovate with a short terminal awn . . . . . *Muhlenbergia*
        24. Spikelets 2- to 3(4)-flowered, with 1 perfect floret and 1 to several staminate or sterile florets, long-awned or reduced to awns; glumes variably shaped, short-awned, mucronate, or awnless . . . . . *Bouteloua*



14. Spikelets not involucrate.
25. Spikelets with 1 perfect floret, or if dioecious, plants then with 1 staminate or pistillate functional floret, additional reduced florets present or absent.
26. Spikelets arranged in pairs, 1 sessile and another pedicelled, the pedicelled spikelet staminate, neutral or reduced, sometimes represented by only the pedicel; lower glume large and firm, enclosing the second within its margins; lemma of perfect florets membranous, slender, often awned.
27. Spikelets all alike and perfect.
  28. Spikelets unawned; panicle densely silky, with long hairs surrounding the base of the spikelets. .... *Imperata*
  28. Spikelets awned.
    29. Rachis readily breaking up into joints; pedicel often tipped by a rudimentary spikelet; panicle often white-pilose, commonly with few branches ..... *Andropogon*
    29. Rachis continuous; pedicel never with a rudimentary floret; panicle yellow to golden brown, usually with numerous branches ..... *Sorghastrum*
27. Spikelets not all alike and perfect, the pedicellate ones (sometimes some of the sessile ones) staminate or neuter.
  30. Spikelets all awnless.
    31. Spikelets sessile, globose; lower glume ornamented, black, rough; plants annual; inflorescences 1–2 cm long ..... *Hackelochloa*
    31. Spikelets sessile, not globose; lower glume never ornamented, stramineous, smooth; plants perennial; inflorescences 5–15 cm long ..... *Elionurus*
  30. Spikelets awned, at least some of them.
    32. Awns at least (2.5)3 cm long.
      33. Pedicelled spikelets awned, perfect; sessile (to subsessile) spikelets staminate or neutral, awnless ..... *Trachypogon*
      33. Pedicelled spikelets awnless, staminate or neutral; sessile spikelets perfect, awned.
        34. Sessile spikelet dorsally compressed; callus obtuse ..... *Dichanthium*
        34. Sessile spikelet cylindrical; callus enlarged, sharp, oblique ..... *Heteropogon*
    32. Awns at most 2.5 cm long, or missing.
      35. Branches of the panicle numerous, freely branched, not conspicuously spiciform.
      36. Pedicelled spikelets reduced, represented by a pedicel; sessile spikelet usually hispidulous ..... *Sorghastrum*
      36. Pedicelled spikelets nearly the same size as sessile ones, staminate or sometimes neutral; sessile spikelets glabrous, hirsute or appressed-hispidulous ..... *Sorghum*
    35. Branches of the panicle 1 to several, not branched or sparsely so, apparently spiciform.
      37. Inflorescence a spike, slender, partially enclosed by a sheath in the way of spathe; pedicels and rachis internodes clavate, spongy ..... *Schizachyrium*
      37. Inflorescence a spreading panicle, with 2 to several racemose spikes; pedicels and rachis internodes not clavate or spongy.
        38. Rachis internodes and pedicels with a central narrow groove, hyaline and translucent; racemes 4 or more, digitate or subdigitate, not spatheate ..... *Bothriochloa*
        38. Rachis internodes and pedicel without a central translucent groove; racemes 2 or 3, digitate, spatheate ..... *Andropogon*
26. Spikelets arranged in pairs or not, if in pairs, then pedicelled spikelets not reduced, and the lower glumes not longer and firmer than the lemma of the perfect florets.
39. Spikelets laterally compressed.
  40. Inflorescence of 1 or more spikes or racemes ..... *Oplismenus*
  40. Inflorescence a dense or open panicle.
    41. Leaves pubescent; florets 2, the lower perfect, awnless, the upper floret staminate with a short, hooked awn ..... *Holcus*
    41. Leaves glabrous; floret solitary, perfect, awned from below middle ..... *Alopecurus*
39. Spikelets dorsally compressed.
  42. Reduced floret present, placed below the fertile floret, represented by a lemma similar to the upper glume in size and texture (with or without palea), spikelet frequently appearing to have 3 glumes; disarticulating below the glumes (spikelets falling entire at maturity).

- 43. Spikelets subtended by 1 to many bristles or flattened spines; bristles or spines forming an involucre, fused or not fused.
- 44. Bristles united at base or a little ( $\frac{1}{2}$ ) above the base, forming a cup-shaped receptacle, subspherical, falling with the spikelets at maturity, thorny and hard or softly feathery . . . . . *Cenchrus*
- 44. Bristles totally free, persistent, usually up to 3 mm long, not falling with the spikelets at maturity, never feathery.
- 45. Sterile lemma narrower than upper glume, ovate to orbiculate, with undulate or contoured base and narrow apex, a bristle present below each spikelet, but this is sometimes missing . . . . . *Setariopsis*
- 45. Sterile lemma similar to upper glume, ovate; 1 or several bristles below each spikelet, or partially missing in the panicle . . . . . *Setaria*
- 43. Spikelets not subtended by bristles or flattened spines; bristles or flattened spines not present.
- 46. Inflorescence with spikelets appressed to and partially embedded in the flattened, corky rachises; upper glume present . . . . . *Stenotaphrum*
- 46. Inflorescence not as above, or if so, then the upper glume always absent.
- 47. Spikelets awned.
- 48. Lower glume awnless.
- 49. Upper glume sometimes mucronate; pedicels, upper glume, and lemma with silky hairs, pink changing to white at maturity; weeds introduced in arid places . . . . . *Melinis*
- 49. Upper glume short-awned; pedicels, upper glumes and lemma scabrous and without silky hairs; native aquatic plants . . . . . *Echinochloa*
- 48. Lower glumes awned.
- 50. Awns of both glumes similar sized . . . . . *Chaetium*
- 50. Awn of lower glume 3 times longer than the body of the spikelet, awn of the upper glume shorter . . . . . *Oplismenus*
- 47. Spikelets awnless or the upper glume sometimes mucronate.
- 51. Lemma of perfect floret slender and flexible, its margins extended, membranous, not inrolled over the palea, even when partially covering it; lower glume small or absent.
- 52. Inflorescences with 2 or several spiciform, spikelike branches . . . . . *Digitaria*
- 52. Inflorescences with numerous spreading branches, paniculate.
- 53. Panicle spreading, dense; pedicels and spikelets with silky hairs, dense, pinkish, 5–6 mm long . . . . . *Melinis*
- 53. Panicle very diffuse; pedicels glabrous; upper glume and lemma sterile with sparsely silky hairs, appressed, 1–2 mm long . . . . . *Digitaria* (*D. cognata*)
- 51. Lemma of perfect floret relatively hardened, its margins rolled on the palea; lower glume present or absent.
- 54. Lower glume missing in some or all spikelets.
- 55. Fertile lemma often with a terminal mucro; spikelets with a thickened callus in a ring or cup shape at the base, dorsally compressed; back of the sterile lemma oriented toward the rachis of the inflorescence . . . . . *Eriochloa*
- 55. Fertile lemma usually not mucronate; spikelets without a thickened callus shaped as a ring or cup, in pairs or solitary, typically plano-convex; back of the upper glume and fertile lemma oriented toward the rachis of the inflorescence . . . . . *Paspalum*
- 54. Lower glume present in all spikelets.
- 56. Dorsal side of the fertile lemma facing away from the rachis; spikelets solitary; fertile lemma whitish, finely wrinkled or reticulate at maturity . . . . . *Urochloa*
- 56. Dorsal side of the fertile lemma (in most of the spikelets) turned toward the rachis; spikelets in pairs or solitary; fertile lemma smooth, not rough or reticulate (except in *Zuloagaea bulbosa*).
- 57. Primary branches of the inflorescence simple, unbranched; fertile lemma smooth, shiny . . . . . *Echinochloa*
- 57. Primary branches of the inflorescence (at least some of them) branched; fertile lemma smooth to slightly roughened.

- 58. Fertile lemma and palea with a tuft of hairs at the apex; woody stems bamboo-like, often climbing . . . . . *Lasiacis*
- 58. Fertile lemma and palea without a tuft of hairs at the apex; stems herbaceous, erect.
- 59. Terminal inflorescences with chasmogamous spikelets flowering first, axillary inflorescences with cleistogamous spikelets, smaller, later-flowering; plants with leaf dimorphism, frequently producing wide and short basal leaves in a rosette . . . . . *Dichanthelium*
- 59. All inflorescences with chasmogamous spikelets, flowering at the same time; plants without leaf dimorphism, not producing wide and short basal leaves in a rosette.
- 60. Panicle branches 1-sided; spikelets usually sessile; pedicels up to 2 mm long . . . . . *Hopia*
- 60. Panicle branches generally symmetrical; spikelets not sessile; pedicels 2–20 mm long.
- 61. Perfect floret striate to transversely rugose; culms with cormiform rhizomes; inflorescence branches opposite and alternate, never whorled; sheaths keeled . . . . . *Zuloagaea*
- 61. Perfect floret smooth to striate, rarely slightly rugose; culms never cormose; sheaths not keeled . . . . . *Panicum*
- 42. Reduced floret absent, if present then the lemma dissimilar to the upper glume in size and texture; generally disarticulating above glumes (leaving empty glumes in mature inflorescences).
- 62. Spikelets with 1 or more reduced florets.
  - 63. Inflorescence a spreading panicle; spikelets paired, golden, awned, slightly geniculate, 10–15(17) mm long; every spikelet accompanied by 1 or 2 sterile pedicels at the base . . . . . *Sorghastrum*
  - 63. Inflorescence with spikelets grouped in spikes, spiciform panicles or panicles with spiciform branches; spikelets green to brown (the mature ones of *Hordeum* become golden), awns straight, of several sizes, without sterile pedicels at the base.
  - 64. Inflorescence a spike or spiciform panicle, cylindrical to ovoid, with the spikelets arranged symmetrically around the rachis.
  - 65. Lemma veins of the 2 lower florets conspicuous, consistently 9 in number, prolonged into 9 plumose awns . . . . . *Enneapogon*
  - 65. Lemma veins inconspicuous; awns (if present) not plumose.
  - 66. Lemma of perfect (actually pistillate) florets with 3 awns; plant with stolons; plants perennial . . . . . *Scleropogon*
  - 66. Lemma of perfect florets with 1 awn or awnless; plants not stoloniferous; plants often annual.
  - 67. Spikelets prominently awned, arranged in groups of 3, the lateral spikelets reduced to awns . . . . . *Hordeum*
  - 67. Spikelets awnless or short-awned, 3-flowered, the 2 reduced florets never awnlike in shape.
  - 68. Reduced florets sterile, shorter than perfect florets, reduced to small scale-like lemmas, not awned . . . . . *Phalaris*
  - 68. Reduced florets staminate or sterile, longer than the perfect florets, brownish, hirsute, awned, 1 of the awns twisted and exserted, the other short and erect . . . . . *Anthoxanthum*
  - 64. Inflorescence of 1, several, or many spikes (or spiciform racemes) digitate to racemose; spikelets arranged only on 1 side of the rachis.
  - 69. Inflorescence branches (spikes) scattered along the main axis or sometimes solitary . . . . . *Bouteloua*
  - 69. Inflorescence branches digitate, often with additional solitary branches above or below the verticil.
  - 70. Lemma awned . . . . . *Chloris*
  - 70. Lemma awnless.

- 71. Reduced florets 1.3–1.5 mm long, truncate, bell-shaped; inflorescence branches generally more than 6 ..... *Chloris* (*C. submutica*)
- 71. Reduced florets up to 0.5 mm long, or often only the rachis present; inflorescence branches generally 4 or 5 ..... *Cynodon*
- 62. Spikelets missing reduced florets or, if present, inconspicuous.
- 72. Inflorescence 1 spike, a spiciform raceme, or a panicle composed by several spikes or not rebranched racemes.
- 73. Inflorescence a single terminal spike.
  - 74. Spikelets unilateral (on 1 side) on rachis, 2.5–3.5 mm long, awnless, solitary ..... *Microchloa*
  - 74. Spikelets bilateral on rachis, more than 1 cm long, largely awned, 3 per inflorescence node, the lateral spikelets often reduced to awns ..... *Hordeum*
- 73. Inflorescence composed of 2 to several spikes.
  - 75. Glumes missing; aquatic or subaquatic plants ..... *Leersia*
  - 75. Glumes at least 1 present; plants usually terrestrial.
  - 76. Upper lemma margins inrolled (appearing to clasp) over the palea margins, relatively thick and rigid, the apex usually obtuse ..... *Paspalum*
  - 76. Upper lemma margins folded over the palea margins, relatively thin and flexible, the apex acute or acuminate.
  - 77. Lemma folded and consequently the spikelet appearing to be laterally compressed; inflorescence with 4 or 5 digitate spikes; plants notably stoloniferous ... *Cynodon*
  - 77. Lemma concave-convex and consequently the spikelet appearing dorsoventrally compressed, margins of the lemma conspicuously hyaline; inflorescence usually subdigitate; plants caespitose, stoloniferous, or rhizomatous ..... *Digitaria*
- 72. Inflorescence a spreading or contracted panicle, sometimes spikelike, but primary branches rebranched (early branches very reduced and the spikelets crowded on sessile or nearly sessile glomerules).
- 78. Glumes and lemma awnless, the lemma sometimes mucronate.
- 79. Glumes as long as, or longer than, the lemma.
  - 80. Sheaths of basal leaves folded, conspicuously compressed, carinate; plants 1 m tall or more ..... *Muhlenbergia*
  - 80. Sheaths of the leaves rounded on the back, not compressed or carinate.
  - 81. Glumes 4–10 mm long; panicle spikelike ..... *Muhlenbergia*
  - 81. Glumes usually at most 4 mm long, sometimes reaching this length, but then the panicle open or contracted, not appearing spikelike.
  - 82. Rachilla prolonged beyond the insertion of the palea; palea well-developed,  $\frac{1}{2}$  as long as the lemma, 2-veined ..... *Calamagrostis*
  - 82. Rachilla usually not prolonged beyond the insertion of the palea; palea missing or reduced, veinless ..... *Agrostis*
- 79. Glumes, at least the first, shorter than the lemma.
  - 83. Lemma veins densely silky-pubescent; caryopsis ellipsoid, free from floral envelopes at maturity ..... *Muhlenbergia*
  - 83. Lemma veins not densely silky-pubescent; caryopsis obovate, cylindrical or somehow compressed, free or united to the floral envelopes at maturity.
  - 84. Lemma 1-veined; caryopsis obovate, notably compressed, free from the floral envelope at maturity ..... *Sporobolus*
  - 84. Lemma 3- to 5-veined, sometimes the lateral veins inconspicuous; caryopsis cylindrical or slightly compressed, still united to the floral envelope at maturity ..... *Muhlenbergia*
- 78. Glumes or lemmas, or rarely both, awned.
  - 85. Spikelets in groups of 3 at each node of the axis, the central sessile, the lateral ones in the form of bristles ..... *Hordeum*
  - 85. Spikelets not in groups of 3, sometimes involucre subtended by bristles.
  - 86. Spikelets in small racemes at the nodes of a narrow and dense panicle, the racemes subtended by a group of bristles on 1 side, the upper spikelets of racemes naked ..... *Muhlenbergia* (*M. pereilema*)

- 86. Spikelets never subtended by bristles.
- 87. Lemma awn emerging from the back, or from the middle of the lobes of a deeply 2-toothed apex.
- 88. Spikelets 6 mm or more long (without the awn), brownish or golden, accompanied at the base by 1 or 2 pedicels from missing spikelets . . . . . *Sorghastrum*
- 88. Spikelets at least 6 mm long (without the awn), stramineous or light green, not accompanied by pedicels from missing spikelets.
- 89. Awn of glumes longer than lemma awn; spikelets disarticulating below the glumes and falling entire at maturity . . . . . *Polypogon*
- 89. Glumes awnless; spikelets disarticulating above the glumes, which remains attached to the mature inflorescences.
- 90. Palea missing or reduced when present, veinless; rachilla generally not prolonged beyond the insertion of the palea . . . . . *Agrostis*
- 90. Palea well-developed, 2-veined,  $\frac{1}{2}$  as long as the lemma; rachilla prolonged beyond the insertion of the palea . . . . . *Calamagrostis*
- 87. Lemma awn emerging from an entire apex, which can be minutely 2-toothed, or the lemma awnless.
- 91. Lemma notably hardened, permanently enclosing the palea and caryopsis.
- 92. Lemma awn divided in 3 branches, the lateral branches sometimes less than 1 mm long . . . . . *Aristida*
- 92. Lemma awn not divided.
- 93. Palea longitudinally grooved, nearly as long as the lemma, 2-keeled; margins of lemma involute . . . . . *Piptochaetium*
- 93. Palea flat, hidden by the convoluted margins of the lemma.
- 94. Palea pubescent between the veins; apex of the lemma with hairs not swollen at base and not forming a cylindrical crown . . . . .  
. . . . . *Achnatherum*
- 94. Palea glabrous; apex of the lemma with hairs swollen at the base and forming a crown.
- 95. Apex of lemma prolonged into a smooth crown, cylindrical; palea  $\frac{1}{3}$  as long as the lemma; awn glabrous or scabrous on the terminal segment . . . . . *Nassella*
- 95. Apex of lemma glabrous; palea as long as the lemma; awn pilose on the terminal segment . . . . . *Hesperostipa*
- 91. Lemma not notably hardened, not permanently enclosing the palea and caryopsis.
- 96. Lemma shorter than glumes.
- 97. Glume awns longer than lemma awn; spikelets disarticulating below the glumes, so falling entire at maturity . . . . . *Polypogon*
- 97. Glume awns missing or shorter than lemma awn; spikelets disarticulating above the glumes, these persistent at maturity . . . . *Muhlenbergia*
- 96. Lemma as long as, or longer than, glumes . . . . . *Muhlenbergia*
- 25. Spikelets with 2 or more perfect florets or, if unisexual, with 2 or more staminate or pistillate functional florets.
- 98. Lemma with 9 or more awns or awn-shaped lobes.
- 99. Awns antrorsely bearded, unequal and interspersed with awned teeth; spikelets 6- to 10-flowered, rachilla disarticulating between the florets; panicle usually spreading . . . . . *Cottea*
- 99. Awns forming a crown, not antrorsely bearded or plumose, but never interspersed with awned teeth; spikelets 3- to 6-flowered, falling as a unit; panicle narrow.
- 100. Spikelets 3-flowered, the first floret fertile with 9 plumose awns, equal in length . . . . . *Enneapogon*
- 100. Spikelets 4- to 6-flowered, with 1 to 3 lower fertile florets; awns numerous, not plumose, unequal in length . . . . . *Pappophorum*
- 98. Lemma awnless or up to 3-awned.
- 101. Plants robust, generally 2–8 m tall; inflorescences as large, generally plumose panicles 30–70 cm long.
- 102. Lemmas glabrous; rachilla silky; the lowest floret staminate or sterile, persistent, the upper florets fertile  
. . . . . *Phragmites*

102. Lemmas pilose; rachilla glabrous; the florets all alike.
103. Leaves mostly basal, blades narrow, not cordate to clasping below; florets unisexual, the pistillate florets occasionally with reduced stamens ..... *Cortaderia*
103. Leaves cauline, the blades cordate to clasping below; florets perfect ..... *Arundo*
101. Plants generally less than 2 m tall; inflorescences varied in shape and length but never a plumose panicle.
104. Spikelets sessile or subsessile; inflorescence a spike, raceme, or a spiciform panicle, the branches unbranched.
105. Inflorescence a branched panicle, the spikelets placed on 1 side of the rachis of spikes or simple racemes (not rebranched).
106. Inflorescence with several digitate spikes, whorled or crowded at the apex of culms.
107. Rachis of each branch projecting beyond the spikelets as a rigid tip, 1.5–5 mm long; upper glume awned ..... *Dactyloctenium*
107. Rachis not projecting beyond the spikelets; upper glume unawned.
108. Branches of the inflorescence up to 1 cm long; spikelets monoecious, with 2 or 3 staminate florets ..... *Bouteloua*
108. Branches of the inflorescence 1–12 cm long; spikelets with perfect and sterile florets.
109. Lemma awnless; upper glume 3- to 7-veined, the lateral veins very close to the central vein; spikelets with 4–10 similar perfect florets ..... *Eleusine*
109. Lemma with 1 or 3 awns; upper glume 1-veined; spikelets with 1 basal perfect floret plus 1 or several reduced sterile florets above.
110. Lemmas laterally compressed; the perfect lemma 1-awned .... *Chloris*
110. Lemmas dorsally compressed; the perfect lemma 3-awned ..... *Leptochloa*
106. Inflorescence with numerous slender spikes, rarely more than 1 at each node.
111. Spikelets on pedicels at least ½ as long as the spikelet; occasionally some of the primary branches rebranched; spikelets never in 2 rows along 1 side of the rachis; lemma awnless.
112. Plants with long, scaly rhizomes, 4–8 mm thick; leaf blades arcuate with the apex sharply pointed ..... *Kalinia*
112. Plants without rhizomes or with short, knotty rhizomes less than 4 mm thick, often stout but never elongated; leaf blades straight without sharp-pointed apex ..... *Eragrostis*
111. Spikelets in short pedicels, arranged in 2 rows along the lower side of the rachis; primary branches unbranched; lemma awned or unawned.
113. Ligules 4–8(15) mm long, apex acute to attenuate, lacerate ..... *Diplachne*
113. Ligules 0.2–8 (15) mm long, apex usually truncate to obtuse and somewhat erose.
114. Apex of the lemmatal hairs clavicorniculate, ovate to broadly ovate; base of lemma often indurate and sometimes 5-veined; plants perennial; ligules 0.8–2.2 mm long, apex erose ..... *Disakisperma*
114. Apex of the lemmatal hairs ovate to acute, never clavicorniculate; base of lemma soft and always 3-veined; plants annual or perennial; ligules (0.2)0.5–5.5(7.0) mm long, apex usually entire.
115. Panicle branches subdigitate, inserted along the rachis usually with 2 or more branches per node; lemmas 1- to 3-awned or unawned; plants perennial; culms solid; ligule apex ciliate ..... *Leptochloa*
115. Panicle branches racemosely inserted along the rachis, rarely subdigitate, usually with a single branch per node; lemmas unawned; plants annual or perennial; culms solid or hollow; ligule apex never ciliate ..... *Dinebra*
105. Inflorescence a spike or a solitary raceme, not rebranched.
116. Spikelets arranged on 1 side of the rachis, forming a distinctly unilateral inflorescence ..... *Bouteloua*
116. Spikelets arranged symmetrically, scattered on both sides of the rachis, forming a bilateral inflorescence.
117. Lemma with an awn or awns 1.5–10 cm long.
118. Glumes linear to subulate, the awn 3–10 cm long ..... *Elymus*
118. Glumes lanceolate or ovate, awnless or the awn less than 3 cm long.



- 119. Lemma with 3 awns 3.5–10 cm long; glumes lanceolate, membranous; spikelets with several florets, lower florets reduced usually to awns ..... *Scleropogon* (pistillate)
- 119. Lemma with 1 awn up to 12 cm long; glumes ovate, coriaceous; spikelets with several florets, the lower ones perfect ..... *Triticum*
- 117. Lemma without awn, or the awn less than 1.5 cm long.
  - 120. Distal rudimentary florets 3-awned, plumose ..... *Blepharidachne*
  - 120. Distal rudimentary florets 1-awned, not plumose.
    - 121. Inflorescence a panicle 1–2.5 cm long; spikelets in a tight capitate cluster, subtended by leafy bracts ..... *Dasyochloa*
    - 121. Inflorescence a spike 1.3–45 cm long, thick and elongated; spikelets alternately arranged on opposite sides of the rachis, exerted never subtended by leafy bracts.
      - 122. Spikelets 1 to 3 at each node of the rachis; glumes subulate or setaceous ..... *Elymus*
      - 122. Spikelets solitary at each node of the rachis; glumes narrowly lanceolate to oblong.
        - 123. Glume solitary, except the terminal spikelet; spikelets oriented edge-wise against the rachis ..... *Lolium*
        - 123. Glumes 2; spikelets with the broad face disposed toward the rachis.
          - 124. Glumes lanceolate to ovate; lemmas asymmetrically keeled; perennial plants ..... *Agropyron*
          - 124. Glumes broadly ovate; lemmas symmetric; annual plants ..... *Triticum*
- 104. Spikelets pedicelled; inflorescence an open panicle, sometimes spiciform or racemose-like with branches rebranched.
  - 125. Lemma with a dorsal awn; upper glume more or less the same size or longer than the lemma.
    - 126. Spikelets with 3 florets, the 2 lower florets awned, staminate or sterile; the upper floret perfect, awnless ..... *Anthoxanthum*
    - 126. Spikelets with 2 to numerous florets, lower floret perfect; upper floret(s) reduced or sterile.
      - 127. Glumes 2 cm long or more; annual weed, introduced ..... *Avena*
      - 127. Glumes up to 1 cm long; perennial, native.
        - 128. Awn originating in the upper ½ or ⅓ of the lemma; lemmas keeled .... *Trisetum*
        - 128. Awn originating at the base of the lemma; lemmas rounded .... *Deschampsia*
  - 125. Lemma with a terminal awn, or unawned; upper glume usually shorter than the lemma (except in *Trisetum* and *Peyritschia*).
    - 129. Lemma with 3 conspicuous veins.
      - 130. Lemma awned; branches of the panicle simple, without secondary branches.
        - 131. Glumes similar in length to the spikelet; inflorescence a compound panicle; spikelets arranged radially in all directions around the rachis ..... *Erioneuron*
        - 131. Glumes notably shorter than the spikelet; inflorescence a panicle of slender unilateral racemes; spikelets in 2 rows on the lower sides of the rachis ..... *Leptochloa*
      - 130. Lemma awnless; branches of the panicle with secondary branches.
        - 132. Florets 1–2(3) per spikelet, typically only the lower one perfect; ligules 6–10 mm long, membranous; panicle narrow ..... *Muhlenbergia*
        - 132. Florets usually more than 2 per spikelet, all perfect; ligules reduced to a row of hairs; panicle spreading.
          - 133. Lemmas glabrous or scabrous over the veins, apex entire, the veins never excurrent ..... *Eragrostis*
          - 133. Lemmas pilose along the lower ½ or over the veins, apex 3-toothed, the veins minutely excurrent.
            - 134. Palea margins widened or bowed-out below; caryopses dorsoventrally compressed and reniform in cross section, dark brown ..... *Tridens*

134. Palea margins not widened or bowed-out below; caryopses dorsally flattened and deeply concave to folded on the dorsal or hilar surface and thickened toward the margin below, surface reticulate, reddish-brown  
 ..... *Tridentopsis*
129. Lemma with 5 or more veins, or without conspicuous veins.
135. Rachilla extending as a bristle beyond the upper floret; spikelets with 2(3) florets; endosperm liquid and caryopsis soft; glumes as long or nearly as long as the spikelet.
136. Stamens 2; glumes linear, isomorphic, 1- to 3-veined; lemma awned or awnless, with the apex bilobed; palea narrowly enclosed by the lemma margins .... *Peyritschia*
136. Stamens 3; glumes lanceolate, ovate-lanceolate or oblanceolate, heteromorphic, lower glume 1- to 3-veined, upper glume 3- to 5-veined; lemma with 2 to 4 short awns at the apex, or entire, or 2-toothed; palea not narrowly enclosed by the margins of the lemma.
137. Glumes longer than the lemma, equal or subequal among them; awns of the lemma originating in the middle or toward the base ..... *Trisetum*
137. Glumes, at least the first, shorter than the lemma; lemmas generally awnless, or with awns near the apex.
138. Upper glume wider below the center; spikelets 2.5–3 mm long, disarticulating below the glumes, spikelets falling entire ..... *Sphenopholis*
138. Upper glume obovate, wider above the center; spikelets 4–5 mm long, disarticulating above the glumes, glumes persistent on the rachis .....  
 ..... *Koeleria*
135. Rachilla not extending as a bristle beyond the upper floret; spikelets with 3 or more florets; endosperm solid and caryopsis hardened; glumes shorter than the spikelet.
139. Glumes as long as spikelet, twice as long as the floret, unawned to sometimes mucronate ..... *Schismus*
139. Glumes shorter than the spikelet, generally shorter than lemmas.
140. Plants with stolons or elongated rhizomes; florets unisexual on dioecious plants; plants usually less than 40 cm high.
141. Pistillate and staminate inflorescences consisting of a single spikelet enclosed and almost concealed by the uppermost leaf sheath .... *Distichlis*
141. Pistillate and staminate inflorescences consisting of more than 1 spikelet, well-exserted above the uppermost leaf sheath.
142. Glumes and lemmas ovate, acute to obtuse at the apex; plants with scaly and creeping rhizomes ..... *Distichlis* (staminate or pistillate)
142. Glumes and lemmas lanceolate, long attenuate at the apex; plants without scaly rhizomes ..... *Scleropogon* (staminate)
140. Plants lacking stolons and elongated rhizomes; florets perfect; plants of varying sizes.
143. Sheaths with united margins, at least on the lower  $\frac{1}{2}$  or  $\frac{1}{3}$ .
144. Spikelets strongly compressed on dense 1-sided panicle branches; sheaths keeled and laterally compressed ..... *Dactylis*
144. Spikelets not strongly compressed on dense 1-sided panicle branches; sheaths terete.
145. Lemmas 7-veined, veins almost parallel, not converging at the truncate or rounded apex ..... *Glyceria*
145. Lemmas 3- to 7-veined, veins converging at the obtuse or acute apex, when parallel then less than 7.
146. Upper florets empty, inrolled and reduced to a rudiment; glumes chartaceous or papery ..... *Melica*
146. Upper florets not empty or reduced to a rudiment; glumes usually membranous and not chartaceous or papery.
147. Spikelets awned or unawned, when awnless then at least 15 mm long ..... *Bromus*

- 147. Spikelets awnless, generally shorter than 10 mm long  
..... *Poa*
- 143. Sheaths with free margins down to the base.
  - 148. Lemma awned.
    - 149. Sheaths without auricles ..... *Festuca*
    - 149. Sheaths with auricles, the apex ciliolate ..... *Lolium*
  - 148. Lemma unawned.
    - 150. Lemma less than 4 mm long; plants usually less than 80 cm tall  
..... *Poa*
    - 150. Lemma at least 5.5 mm long; plants often greater longer than 1 m tall.
      - 151. Sheaths lacking auricles ..... *Festuca*
      - 151. Sheaths with auricles, the apex ciliolate ..... *Lolium*

## DESCRIPTIONS

### *Achnatherum* P. Beauv.

**Perennial**; tightly to loosely caespitose, sometimes short rhizomatous. **Culms** erect, not branching at the upper nodes. **Leaves** sometimes concentrated at the base; **sheaths** open, margins often ciliate distally; **ligules** hyaline to membranous, glabrous or pubescent, sometimes ciliate; **blades** flat, convolute, or involute, apex acute, flexible, basal blades not overwintering. **Inflorescences** terminal panicles, usually contracted, sometimes 2 forming at the terminal node. **Spikelets** usually appressed to the branches, with 1 floret; **disarticulation** above the glumes, beneath the floret. **Glumes** exceeding the floret, usually lanceolate, 1- to

7-veined, acute to acuminate, sometimes obtuse; **florets** usually terete, fusiform or globose, sometimes laterally compressed; **lemmas** smooth, usually hairy, sometimes glabrous, hairs to 6 mm long, usually terminating in lobes, sometimes unlobed, apex with a single, terminal, centric awn, awn-lemma junction evident; **awns** centric, readily deciduous to persistent, usually scabrous to scaberulous, sometimes hairy in whole or in part, if shorter than 12 mm long, usually deciduous, not or once-geniculate and sparsely twisted, if longer than 12 mm long, usually persistent, once- or twice-geniculate and twisted below, terminal segment usually straight, sometimes flexuous; **paleas** from  $\frac{1}{3}$  as long as to slightly longer than the lemmas, usually pubescent; **anthers** 3, 1.5–6 mm long, sometimes penicillate. **Caryopsis** fusiform, not ribbed, style bases persistent.  $x = 10$  or 11.

### KEY TO SPECIES OF *ACHNATHERUM*

- 1. Basal blades curling with age, forming circular arcs; paleas  $\frac{1}{4}$ – $\frac{1}{3}$  as long as the lemmas; panicles 7–11 cm long ..... *A. curvifolium*
- 1. Basal blades straight to lax, not forming circular arcs; paleas  $\frac{2}{5}$ – $\frac{4}{5}$  as long as the lemmas; panicles 5–30 cm long.
  - 2. Lemma silky pilose, hairs 3 mm long; lemma awn deciduous, straight, never twisted, rarely geniculate, generally less than 3 to 4 times as long as the grain ..... *A. hymenoides*
  - 2. Lemma glabrous to white-pubescent, hairs less than 1.5 mm long; lemma awn persistent, twisted and geniculate, several times longer than the grain.
    - 3. Lower glume 6–8(9) mm long; inflorescence branches generally ascending or plicate; culms with 3 to 4(5) nodes  
..... *A. multinode*
    - 3. Lower glume (8)10–16 mm long; inflorescence branches open or ascending; culms with 2 to 3 nodes.
      - 4. Inflorescence highly diffuse; lemma awn 34–68 mm long ..... *A. eminens*
      - 4. Inflorescence a spike; lemma awn (20)23–40 mm long ..... *A. robustum*
- 1. *Achnatherum curvifolium* (Swallen) Barkworth, *Phytologia* 74(1): 7. 1993. *Stipa curvifolia* Swallen, *J. Was. Acad. Sci.* 23(10): 456. 1933.

FIGURE 2

**Plants** tightly caespitose, not rhizomatous. **Culms** 25–55 cm tall, 0.7–1 mm thick, glabrous; **nodes** 3. **Basal sheaths** usually puberulent, hairs 0.1–0.2 mm long, sometimes densely tomentose at the base, brown to gray-brown when old; **collars** glabrous,

sometimes with tufts of hair on the sides, hairs to 0.5 mm; **ligules** 0.3–0.6 mm long, truncate, pubescent, hairs about 0.1 mm; **blades** normally valvate to involute, about 0.5 mm in diameter, strongly arcuate, abaxial surfaces pubescent near the base, glabrous and smooth distally, adaxial surfaces densely hairy, hairs to 0.2 mm. **Panicles** 7–11 cm long, 1–2 cm wide; **branches** appressed to strongly ascending, longest branches 3–4 cm. **Glumes** subequal, 10–14 mm long, 0.7–0.9 mm wide; **florets** 6–8 mm long, 0.4–0.8 mm thick, fusiform, terete; **calluses** 1–1.5 mm

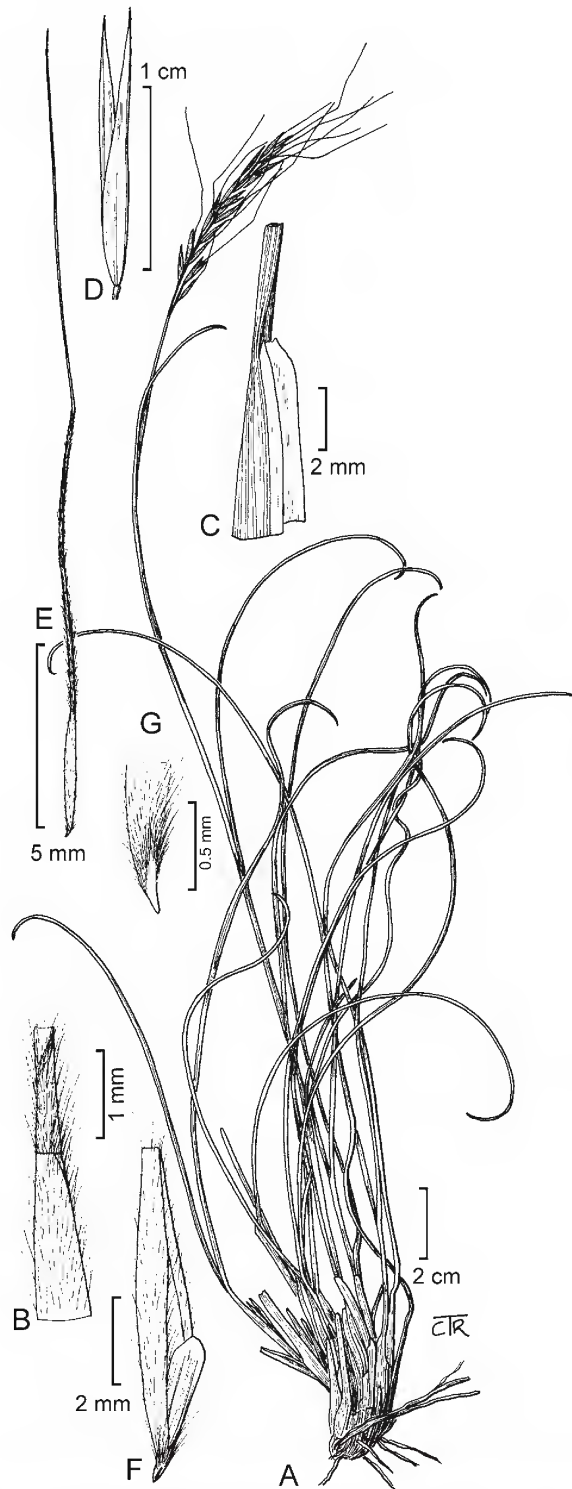


FIGURE 2. *Achnatherum curvifolium*. A. Habit. B. Apex of lemma. C. Ligule. D. Glumes. E. Floret. F. Lemma and palea. G. Callus. Drawn by Cindy Roché; copyright Utah State University.

long, sharp; **lemmas** evenly hairy, hairs at midlength 0.3–1 mm long, apical hairs 1–1.5 mm long, apical lobes not developed; **awns** 22–38 mm long, once-geniculate, first segment pubescent, hairs 1–2 mm long, gradually decreasing in length distally; **paleas** 2–2.3 mm long,  $\frac{1}{4}$ – $\frac{1}{3}$  as long as the lemmas, glabrous; **anthers** about 3.5 mm long, dehiscent, not penicillate. **Caryopsis** about 4 mm long, fusiform.  $2n = 44$ .

**DISTRIBUTION AND HABITAT.** *Achnatherum curvifolium* grows on cliffs and in disturbed, rocky, limestone habitats. It is reported from United States and northern Mexico. It is most readily distinguished from other species of the genus by its combination of curly leaves and hairy awns.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

2. *Achnatherum eminens* (Cav.) Barkworth, *Phytologia* 74(1): 7. 1993. *Stipa eminens* Cav., *Icon.* 5: 42, t. 467, f. 1. 1799.

FIGURE 3

**Plants** caespitose, short rhizomatous, bases knotty. **Culms** 50–100 cm tall, 0.8–1.5 mm thick, glabrous; **nodes** 2–3. **Basal sheaths** mostly glabrous, ciliate on the margins; **collars** glabrous on the back, usually with tufts of hair on the sides, hairs about 0.8 mm; **ligules** 1–4.5 mm long, membranous, glabrous, rounded to acute; **blades** 0.7–3.5 mm wide, abaxial surfaces smooth to scaberulous, adaxial surfaces prominently ribbed, scaberulous or sparsely to densely pubescent, hairs about 0.1 mm. **Panicles** 20–55 cm long, 3–8 cm wide, open, often enclosed to midlength at anthesis; lower branches 5–8 cm long, ascending to divergent, flexuous. Lower glumes 5–12 mm long, 0.5–0.7 mm wide, 3- to 5-veined; **upper glumes** 1–4 mm shorter, 3-veined; **florets** 4–7.5 mm long, 0.5–0.9 mm thick, fusiform, terete; **calluses** 1–2 mm long, sharp; **lemmas** evenly hairy, hairs 0.4–0.8 mm throughout, apical lobes not present; **awns** 35–70 mm long, persistent, twice-geniculate, first 2 segments scabrous, terminal segment flexuous; **paleas** 1–2 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the lemmas, sparsely to moderately pubescent, apex rounded, flat; **anthers** 3–3.5 mm long, dehiscent, a few penicillate, hairs about 0.3 mm. **Caryopsis** about 4 mm long, fusiform.  $2n = 44, 46$ .

**DISTRIBUTION AND HABITAT.** *Achnatherum eminens* grows on dry, rocky slopes and valleys in the mountains; its range extends from the southwest United States to Mexico, primarily in desert scrub. It is easy to recognize because of its open panicle, flexuous branches, and flexuous awns.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aguiles Serdán:** Between the higher and the lower parts of Aguiles Serdán, 8 Jul 1972, 1900 m, F. Chiang, T.L. Wendt & M.C. Johnston 8353B (MEXU). **Jiménez:** Sta Eulalia Mts, 12 Aug 1885, C.G. Pringle 384 (US); E. Wilkinson s.n. (US). **Matamoros:** 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 1900 m, P.M. Peterson, Annable & Valdés-Reyna 10875 (US). **Ojinaga:** 5 km sur [S] Rancho Encinillas, 30 Oct 1974, matorral micrófilo [microphyllus scrub], 1000 m, Valdés-Reyna VR-825 (RELC).

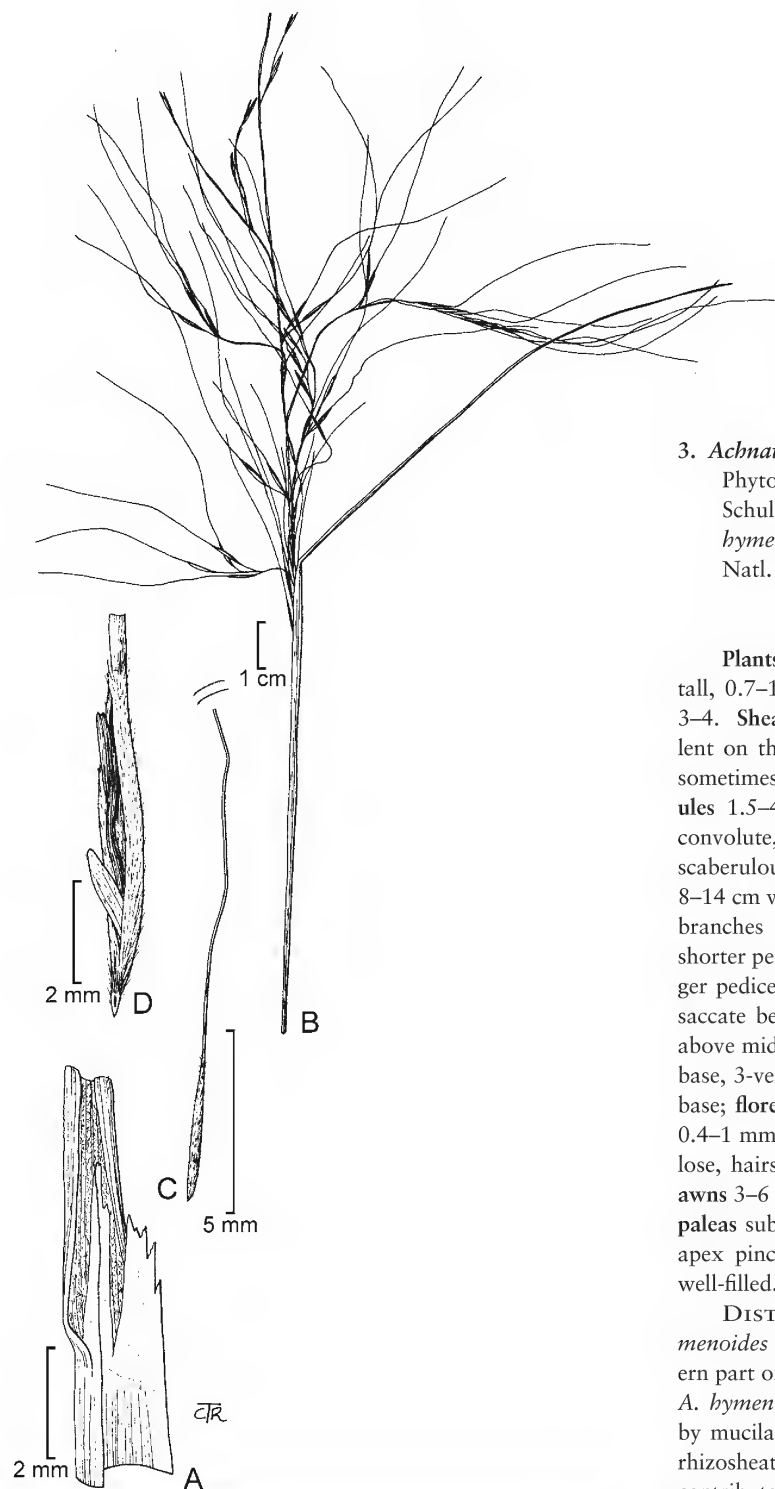


FIGURE 3. *Achnatherum eminens*. A. Ligule. B. Inflorescence. C. Floret. D. Lemma and palea. Drawn by Cindy Roché; copyright Utah State University.

3. *Achnatherum hymenoides* (Roem. & Schult.) Barkworth, Phytologia 74(1): 7–8. 1993. *Stipa hymenoides* Roem. & Schult., Syst. Veg. (ed. 15 bis) 2: 339. 1817. *Oryzopsis hymenoides* (Roem. & Schult.) Ricker ex Piper, Contr. U.S. Natl. Herb. 11: 109. 1906.

FIGURE 4

Plants tightly caespitose, not rhizomatous. Culms 25–70 cm tall, 0.7–1.3 mm thick, glabrous or partly scaberulous; nodes 3–4. Sheaths glabrous or scaberulous, sometimes puberulent on the distal margins, hairs to 0.8 mm; collars glabrous, sometimes with tufts of hair on the sides, hairs to 1 mm; ligules 1.5–4 mm long, hyaline, glabrous, acute; blades usually convolute, 0.1–1 mm in diameter, abaxial surfaces smooth or scaberulous, adaxial surfaces pubescent. Panicles 9–20 cm long, 8–14 cm wide; branches ascending to strongly divergent, longest branches 3–15 cm; pedicels paired, conspicuously divaricate, shorter pedicels in each pair usually at least  $\frac{1}{2}$  as long as the longer pedicels. Glumes subequal, 5–9 mm long, 0.8–2 mm wide, saccate below, puberulent, hairs about 0.1 mm long, tapering above midlength, apex acuminate; lower glumes 5-veined at the base, 3-veined at midlength; upper glumes 5- to 7-veined at the base; florets 3–4.5 mm long, 1–2 mm thick, obovoid; calluses 0.4–1 mm long, sharp; lemmas indurate, densely and evenly pilose, hairs 2.5–6 mm long, easily rubbed off, apex not lobed; awns 3–6 mm long, rapidly deciduous, not geniculate, scabrous; paleas subequal to the lemmas in length and texture, glabrous, apex pinched; anthers 1.5–2 mm long, penicillate, dehiscent, well-filled. Caryopsis 2–3 mm.  $2n = 46, 48$ .

**DISTRIBUTION AND HABITAT.** *Achnatherum hymenoides* grows in dry, well-drained soils, primarily in the western part of the United States and northern Mexico. The roots of *A. hymenoides* are often surrounded by a rhizosheath formed by mucilaginous secretions to which soil particles attach. This rhizosheath harbors nitrogen-fixing organisms that probably contribute to the success of the species as a colonizer.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Juárez: aprox. 6 km al S del poblado [village] Samalayuca, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5280 (UACJ); Near of Paso del Norte, 23 Sep 1886, C.G. Pringle 1053 (US).

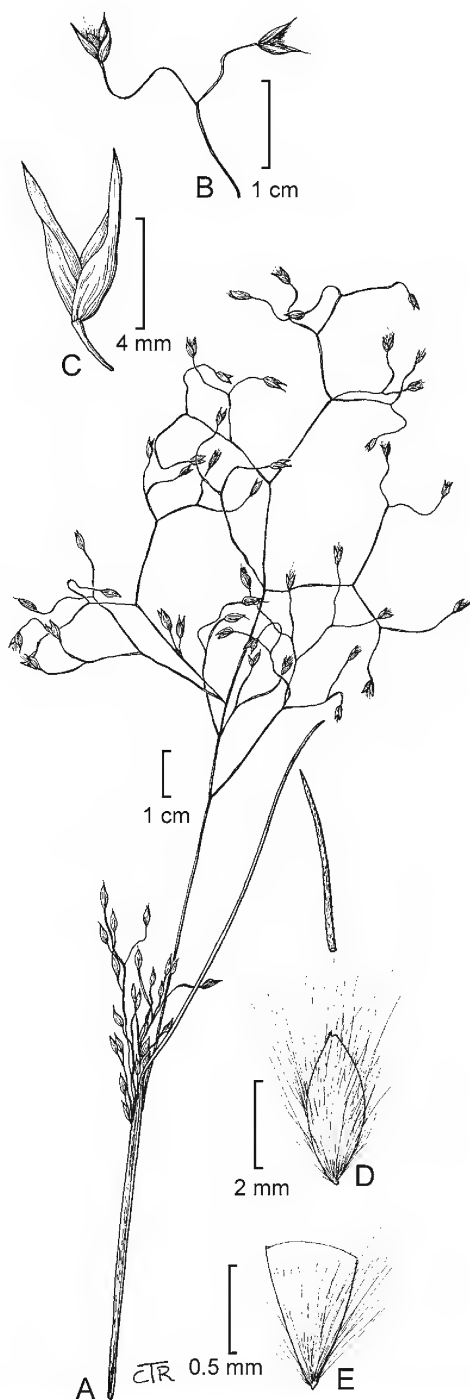


FIGURE 4. *Achnatherum hymenoides*. A. Inflorescence. B. Inflorescence branch. C. Glumes. D. Floret. E. Callus. Drawn by Cindy Roché; copyright Utah State University.

4. *Achnatherum multinode* (Scribn. ex Beal) Valdés-Reyna & Barkworth, Contr. U.S. Natl. Herb. 48: 17. 2003. *Stipa multinodis* Scribn. ex Beal, Grass. N. Amer. 2: 222. 1896.

Plants caespitose, not rhizomatous. Culms 60–120 cm tall, 1.5–3.5 mm thick, erect, mostly glabrous; nodes 2–4. Basal sheaths mostly glabrous, distally ciliate; collars hairy, hairs 1 mm; ligules 0.5–3 mm; a lacerate scale, glabrous; blades 1–1.3 mm wide, firm, rigid, flat and involute toward the apex when mature. Panicles 10–20 cm long, 0.8–1.5 cm wide; branches 1–3(6) cm long, straight, appressed to ascending. Glumes subequal, 6–8(9) mm long, pale hyaline, acuminate, 1- to 3-veined, glabrous; florets 4.5–5.5 mm long, 0.6–0.9 mm thick, fusiform, terete; calluses 0.3–0.5 mm long, barbed; lemmas white-pubescent, hairs 0.5 mm long, apical hairs to 1.5 mm; awns 20–35 mm long, persistent, twice-geniculate, first segment 3.5–8 mm long, glabrous to scabrous, second segment 4–5.5 mm long, terminal segment 18–20 mm long, straight; paleas 3.5–4.6 mm long,  $\frac{3}{4}$  as long as the lemmas, hairy, hairs about 0.5 mm long, not exceeding the apex; anthers 2.5–3.5 mm long.

DISTRIBUTION AND HABITAT. *Achnatherum multinode* grows on dry plains and hills, in open woods and forest clearings, and along roadsides, from the western United States to northern Mexico.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Jiménez: Sta Eulalia Mts, Aug 1885, C.G. Pringle 385 (US), isotype; E. Wilkinson 349 (US).

5. *Achnatherum robustum* (Vasey) Barkworth, Phytologia 74(1): 12. 1993. *Stipa viridula* var. *robusta* Vasey, Contr. U.S. Natl. Herb. 1(2): 56. 1890.

FIGURE 5

Plants caespitose, not rhizomatous. Culms 100–230 cm tall, 2–4.5 mm thick, mostly glabrous, often pubescent below the nodes, the pubescence antrorse or retrorse; nodes 4–5. Basal sheaths mostly glabrous, margins usually ciliate distally; collars hairy, hairs 0.5–2 mm; ligules (1)2–4 mm; truncate, rounded, or obtuse, glabrous; blades 6–10 mm wide, glabrous, abaxial surfaces smooth, adaxial surfaces prominently ribbed, ribs scabrous. Panicles 15–30 cm long, 0.8–3.5 cm wide; branches straight, appressed to ascending, lower branches 3–9 cm. Spikelets appressed to the branches. Glumes subequal, 9–11.5 mm long, 1–1.4 mm wide; florets 5.9–8.5 mm long, 0.9–1.2 mm thick, fusiform, terete; calluses 0.3–1 mm long, blunt; lemmas evenly hairy, hairs at midlength 0.3–0.8 mm long, apical hairs to 1.5 mm; awns 20–32 mm long, persistent, twice-geniculate, scabrous to scabrous, hairs to about 0.1 mm long, longest on the middle segment, terminal segment straight; paleas 3.7–5.6 mm long,  $\frac{2}{3}$ – $\frac{3}{4}$  as long as the lemmas, hairy, hairs about 0.5 mm long, not exceeding the apex, veins terminating below the apex, apex rounded; anthers 4–5 mm long, dehiscent, penicillate. Caryopsis 5–6 mm.  $2n = 64$ .

DISTRIBUTION AND HABITAT. *Achnatherum robustum* grows on dry plains and hills, in open woods and forest



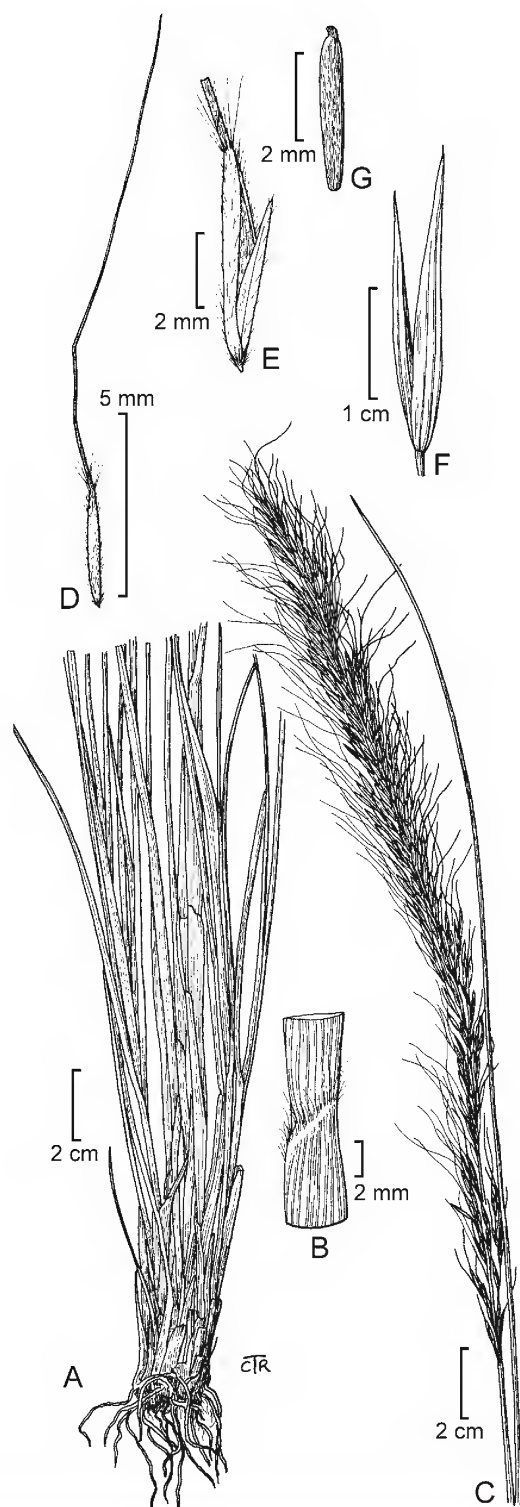


FIGURE 5. *Achnatherum robustum*. A. Habit. B. Ligule. C. Inflorescence. D. Floret. E. Spikelet. F. Glumes. G. Caryopsis. Drawn by Cindy Roché; copyright Utah State University.

clearings, and along roadsides, from the western United States to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

### *Aegilops* L.

Annual. Culms usually glabrous, erect or geniculate at the base, with 2–4(5) nodes. Sheaths open; auricles ciliate; ligules membranous, truncate; blades, linear to linear-lanceolate, flat, spreading. Inflorescence terminal, spikes, with 2–13 spikelets, usually with 1–3 rudimentary spikelets at the base; disarticulation either at the base of the spikes or in the rachis, the spikelets falling attached to the internodes above or below. Spikelets solitary at each node,  $\frac{1}{2}$ –2(3) times the length of the internodes, tangential to the rachis, appressed or ascending, upper spikelet(s) sometimes sterile; bisexual spikelets with 2–7 florets, distal florets often sterile. Glumes ovate to rectangular, rounded on the back, scabrous or pubescent, with several prominent veins, midveins smooth throughout, apex truncate, denticulate, or awned, sometimes indurate at maturity; lemmas rounded on the back, apex toothed, frequently awned; paleas chartaceous, 2-keeled, keels ciliate; anthers 3, not penicillate; ovaries with pubescent apex. Caryopsis lanceolate to lanceolate-ovate.  $\times = 7$ .

*Aegilops* has about 23 species and is native from the Mediterranean region to central Asia, as well as in the Canary Islands; only 1 species occurs in Chihuahua.

6. *Aegilops cylindrica* Host, Icon. Descr. Gram. Austriac. 2: 6, pl. 7. 1802.

FIGURE 6

Culms 14–50 cm tall, erect to decumbent at the base, usually with many tillers. Sheaths with hyaline margins, sometimes ciliate; blades 3–15 cm long, 2–5 mm wide. Spikes 2.2–12 cm long, about 0.3 cm wide, narrowly cylindrical, 10–45 times longer than wide, with (2)3–8(12) bisexual spikelets; rudimentary spikelets absent or 1–2; disarticulation initially at the base of the spikes and secondarily in the rachises, the spikelets remaining attached to the internodes above. Spikelets 9–12 mm long, narrowly cylindrical, scabrous or pubescent, all fertile, with 3–5 florets, lower (1)2–3 florets fertile. Glumes of lower spikelets awned, awns 0.2–0.5 cm; glumes of apical spikelets 7–9 mm long, scabrous, apex with a 3–6 cm awn usually flanked by 2 lateral teeth; lemmas of lower spikelets 9–10 mm long, adaxial surfaces velutinous distally, apex mucronate or awned, awns 0.1–0.5 cm; lemmas of apical spikelets 1-awned, awns 4–8 cm long, flanked by 2 teeth. Caryopsis 6–7 mm long, adhering to the lemmas and paleas.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Aegilops cylindrica* is a widespread weed in North America, being particularly troublesome in winter wheat. It usually grows in disturbed sites such as roadsides, fields, and along railroad tracks. It is native

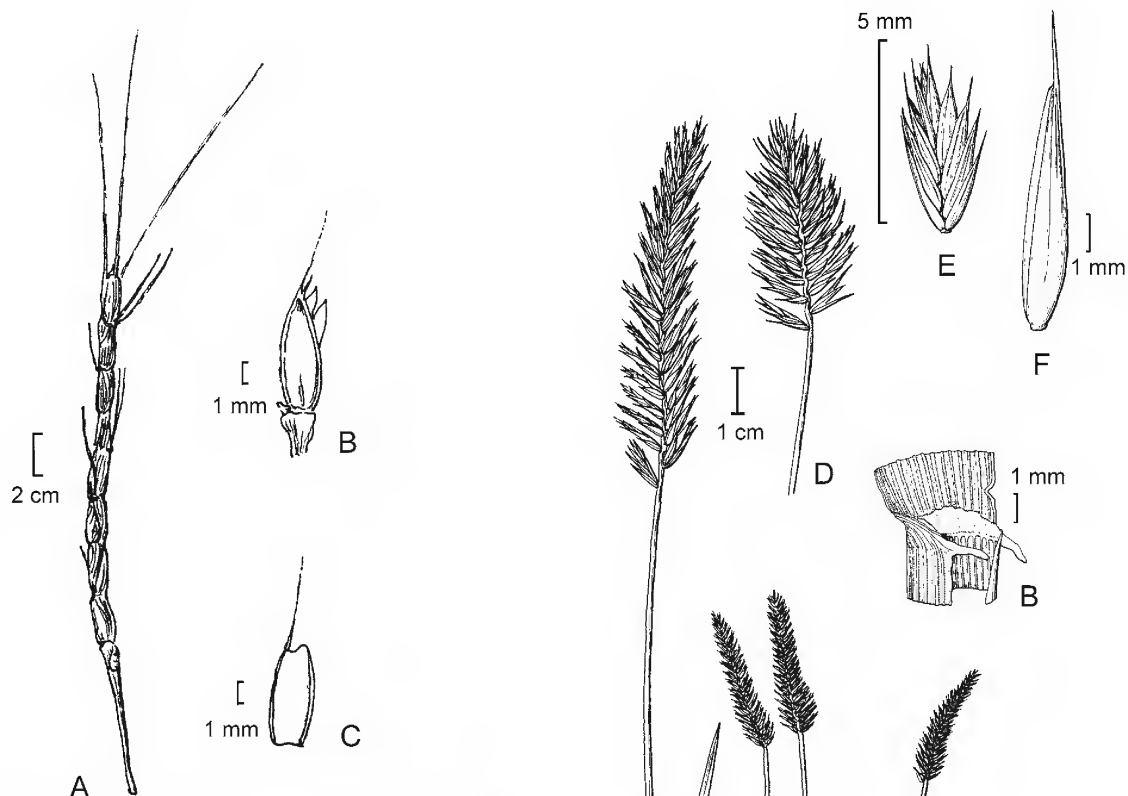


FIGURE 6. *Aegilops cylindrica*. A. Inflorescence. B. Spikelet, ventral view. C. Glume. Drawn by Cindy Roché; copyright Utah State University.

to the Mediterranean region and central Asia and is adventive in other temperate countries. It is reported from Mexico only from specimens cultivated in an experimental station (Rancho La Campana); 38 years later, this species has not been collected again in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Rancho Experimental La Campana, 17 May 1975, Jardín de Observación de zacates [grass observation garden], 1500 m, *Valdés-Reyna* VR899 (RELC).

### ***Agropyron* Gaertn.**

Perennial; densely to loosely caespitose, sometimes rhizomatous. Culms geniculate or erect. Sheaths open; auricles usually present; ligules membranous, often erose. Inflorescences spikes, usually pectinate. Spikelets solitary, usually more than 3 times as long as the internodes, divergent or spreading from the rachis, with 3–16 florets; disarticulation above the glumes and beneath the florets. Glumes shorter than the adjacent lemmas, ovate to lanceolate, 1- to 5-veined, asymmetrically keeled, a secondary

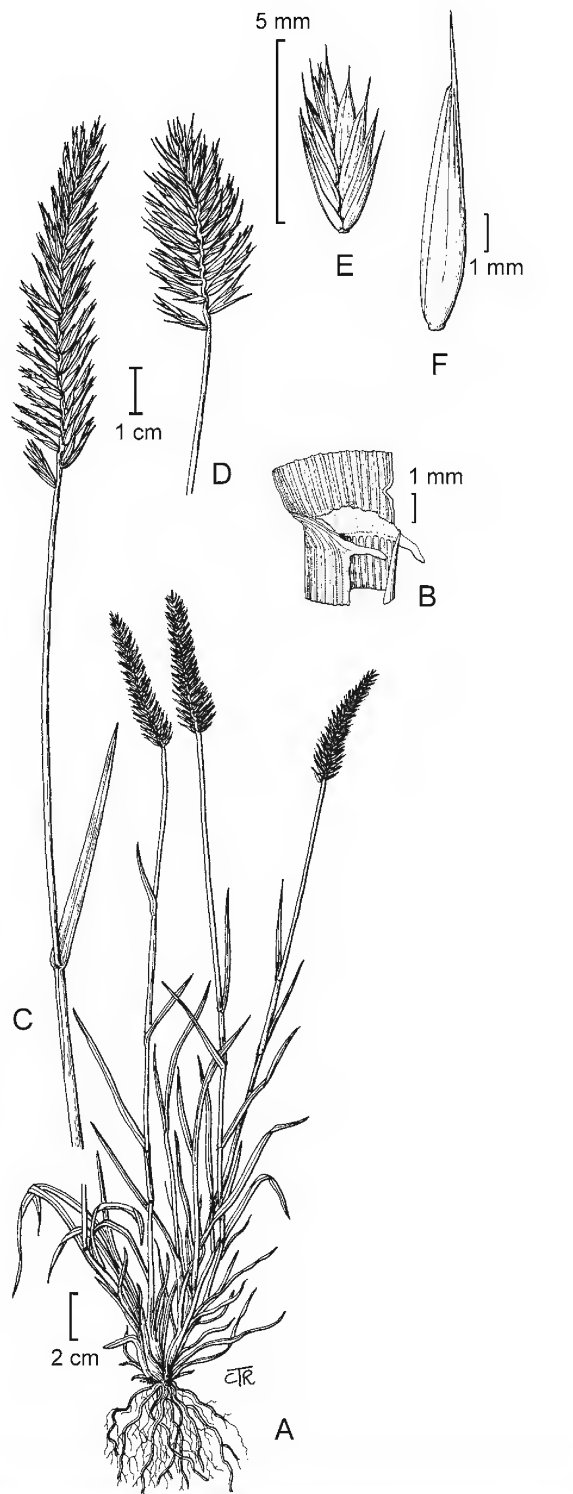


FIGURE 7. *Agropyron cristatum*. A. Habit. B. Ligule. C. Culm and inflorescence. D. Inflorescence. E. Spikelet. F. Lemma. Drawn by Cindy Roché; copyright Utah State University.

keel sometimes present on the wider side, keels glabrous or with hairs, hairs not tufted, apex acute and entire, sometimes awned, awns to 6 mm; lemmas 5- to 7-veined, asymmetrically keeled, acute to awned, awns to 4.5 mm; paleas from slightly shorter than to exceeding the lemma, bifid; anthers 3, 3–5 mm long, yellow. Caryopsis usually falling with the lemmas and paleas attached.  $x = 7$ .

*Agropyron*, it is now agreed, should be restricted to perennial species of *Triticeae* with keeled glumes, that is, *Agropyron cristatum* and its allies.

7. *Agropyron cristatum*\* (L.) Gaertn., *Novi Comment. Acad. Sci. Imp. Petrop.* 14: 540. 1770.

FIGURE 7

Plants occasionally rhizomatous. Culms 25–110 cm tall, sometimes geniculate. Ligules to 1.5 mm; blades 1.5–6 mm wide, glabrous or pubescent. Spikes 1.3–10.5(15) cm long, 5–25 mm wide, narrowly to broadly lanceolate, rectangular, or ovate, sometimes tapering distally; internodes 0.7–5(8) mm long, glabrous or pilose, sometimes all more or less equal, sometimes short and long internodes alternating within a spike, basal internodes often longer than those at midlength. Spikelets 7–16 mm long, diverging at angles of 30°–95° at maturity, with 3–6(8) florets. Glumes 3–6 mm long, glabrous or with coarse hairs on the keels, acute, usually awned, awns 1.5–3 mm; lemmas 5–9 mm long, glabrous or with hairs, keeled, keels sometimes scabrous distally, apex acute, usually awned, awns 1–6 mm; anthers 3–5 mm.  $2n = 14, 28, 42$ .

**DISTRIBUTION AND HABITAT.** *Agropyron cristatum* is native from central Europe and the eastern Mediterranean to Mongolia and China and is introduced in the Americas. We

recognize a broad concept for this taxon and include *A. cristatum* subsp. *desertorum* (Fisch. ex Link) Á. Löve under this highly variable species.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable 5867* (ENCB, US); La Campana, 24 Sep 76, Jardines de Observación Forrajera [forage observation gardens], 1500 m, *S. González 774* (RELC).

## **Agrostis L.**

Plants usually perennial, caespitose, sometimes rhizomatous or stoloniferous. Culms usually erect. Sheaths open, usually smooth and glabrous; ligules membranous, smooth or scabrous dorsally, apex truncate, obtuse, usually erose to lacerate, or entire; blades flat, folded, or involute, usually smooth and glabrous. Inflorescences terminal panicles, narrowly cylindrical and dense to open and diffuse; branches usually in whorls. Spikelets pedicellate, laterally compressed, lanceolate to narrowly oblong or ovate, with 1(2) florets; rachillas not prolonged beyond the base of the floret(s); disarticulation above the glumes, beneath the florets. Glumes 1–2(4) times longer than the lemmas, 1(3)-veined, glabrous, usually mostly smooth, apex acuminate to awn-tipped; lower glumes usually 0.1–0.3 mm longer than the upper glumes, rarely equal; lemmas thinly membranous to hyaline, usually smooth and glabrous, sometimes scabrous, 3- to 5-veined, unawned or awned, awns arising from near the lemma bases to near the apex, usually geniculate, sometimes straight; paleas absent or minute to subequal to the lemmas, usually thin, veins not or only weakly developed; anthers 3, not penicillate; styles 2, free to the base, white; ovaries glabrous. Caryopsis with a hard, soft, or liquid endosperm.  $x = 7$ .

## **KEY TO SPECIES OF AGROSTIS**

1. Prostrate herbs with decumbent culms, stoloniferous; palea evident, 2-veined, at least ½ of the lemma length ..... *A. stolonifera* var. *palustris*
1. Erect herbs, culms not forming stolons; palea absent or minute, reduced to a small scale, rarely longer than ⅓ of the lemma length.
  2. Panicle narrow, laxly cylindrical or spiciform, 5–10 times longer than wide, the branches erect or ascending ... *A. exarata*
  2. Panicle highly branched, diffuse, almost as long as wide at maturity, the branches spread.
    3. Culms 30–40(50) cm tall; spikelets 1.5–1.7 mm long; glumes 1.2–2.3 mm long ..... *A. hyemalis*
    3. Culms 60–100 cm tall; spikelets 2–3.1 mm long; glumes 2–2.6(3) mm long.
      4. Rhizomatous plants; blades basal and cauline; anthers 1–1.3 mm; caryopsis 1–1.2 mm long, endosperm solid ..... *A. subrepens*
      4. Caespitose plants; blades mostly basal; anthers 0.4–0.8 mm; caryopsis 0.9–1.4 mm long, endosperm liquid .... *A. scabra*

8. *Agrostis exarata* Trin., *Gram. Unifl. Sesquifl.* 207. 1824.

FIGURE 8

Perennial; usually caespitose, sometimes rhizomatous, not stoloniferous. Culms 8–100 cm tall, erect or decumbent at base, sometimes rooting at the lower nodes, with (2)3–6 nodes. Leaves

mostly cauline; sheaths smooth or slightly scabrous; ligules (1)1.7–8 mm long, dorsal surfaces scabrous, apex truncate to obtuse, lacerate to erose; blades 4–15 cm long, 2–7 mm wide, flat. Panicles (3)5–30 cm long, 0.5–4 cm wide, contracted, spikelike, oblong, or lanceolate, usually dense, rarely more open, sometimes interrupted near base, bases usually exserted, rarely enclosed by

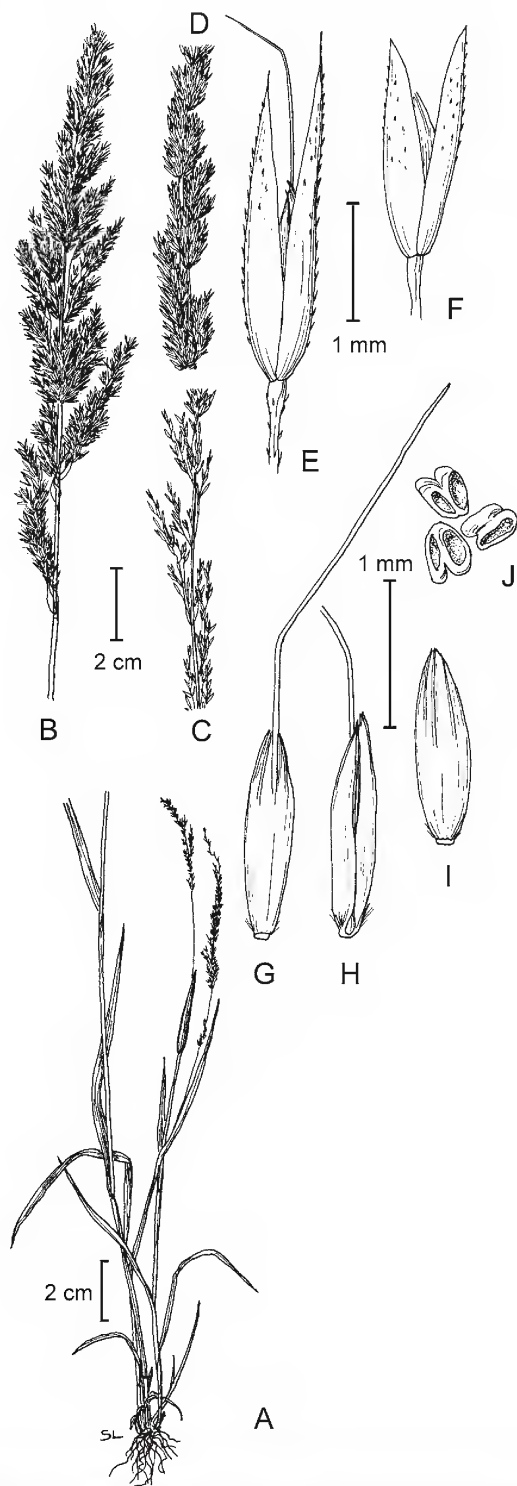


FIGURE 8. *Agrostis exarata*. A. Habit. B. Inflorescence. C. Inflorescence. D. Inflorescence. E. Spikelet. F. Spikelet. G. Floret, dorsal view. H. Floret, ventral view. I. Floret, dorsal view. J. Anthers. Drawn by Sandy Long; copyright Utah State University.

the upper sheaths at maturity, lowest node with 1–5 branches; branches scabrous, ascending to appressed, spikelet-bearing to or near the base, usually hidden by the spikelets, spikelets crowded, lower branches 1–2(4) cm; pedicels 0.2–4.3 mm. Spikelets lanceolate to narrowly ovate, greenish to purplish. Glumes subequal to equal, 1.5–3.5 mm long, scabrous on the midvein and sometimes on the back, 1(3)-veined, acute, elongate-acuminate, with an awn-like tip to 1 mm; callus hairs to 0.3 mm long, sparse to abundant; lemmas 1.2–2.2 mm long, smooth, translucent to opaque, 5-veined, veins prominent distally or obscure throughout, apex acute, entire or toothed, teeth no more than 0.12 mm long, unawned or awned from above midlength, awns to 3.5 mm long, straight or geniculate; paleas absent or to 0.5 mm; anthers 3, 0.3–0.6 mm. Caryopsis 0.9–1.2 mm; endosperm solid or soft.  $2n = 28, 42, 56$ .

**DISTRIBUTION AND HABITAT.** *Agrostis exarata* is common and widely distributed in western North America, usually growing in moist ground in open woodlands, river valleys, tidal marshes, and swamp and lake margins; it also grows in dry habitats such as grasslands and shrublands. It extends from Alaska into Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. E of Rancho El Willy, 8 Jun 1998, *J. Spencer* 687 (US). **Guachochi:** 12.4 km S of Cusarare on road to Guachochi, 25 Sep 1988, pine forest, 2400 m, *P.M. Peterson & Annable* 5889 (ENCB, US); SW of Cusarare at brink of Cascada de Cusarare, 22 Jul 1973, pine-oak, *Bye* 43178 (MEXU). **Ocampo:** Basaseachic Falls, 6 Jul 1936, *LeSueur* Mex-0101 (US); Parque Nacional "Cascada de Basaseachic," ca. 130 air km W of Cuauhtemoc, along river at base of falls, 25 Abr [Apr] 1987, 1600 m, *Spellenberg, Muldavin & R. Corral* 9056 (MEXU, NMC); Parque Nacional "Cascada de Basaseachic," ca. 100 m upstream from the top of the falls along the Rio Basaseachic, 17 Jun 1993, 2000 m, *Spellenberg, L. Brouillet & E. Ulaszek* 11885 (NMC); Parque Nacional "Cascada de Basaseachic," near river at bottom of falls, 26 Abr 1985, 1570 m, *Spellenberg, Soreng & R. Corral* 8022 (MEXU, NMC).

9. *Agrostis hyemalis* (Walter) Britton, Sterns & Poggenb., Prelim. Cat. 68. 1888. *Cornucopiae hyemalis* Walter, Fl. Carol. 73. 1788.

#### FIGURE 9

Perennial or facultative annual; caespitose, not rhizomatous or stoloniferous. Culms 15–82 cm tall, erect, with (3)4–7 nodes. Leaves cauline and basal; sheaths smooth; ligules (0.7)1.2–4 mm long, dorsal surfaces scabrous, apex usually rounded to truncate, sometimes acute, lacerate-erose; blades 3–10 cm long, 1–2 mm wide, flat, becoming involute, or folded. Panicles (5)10–25(36) cm long, (3)4–24 cm wide, broadly ovate, often nearly as wide as long, diffuse, the whole panicle often detaching at base when mature, forming a tumbleweed, bases often enclosed by the upper sheaths, lowest node with (3)5–11 branches; branches scabrous, capillary, flexible, wide-spreading, branching in the distal ¼, spikelets strongly clustered at the branch tips, lower branches 5–15 cm; pedicels 0.1–2.5(3.5) mm. Spikelets ovate to



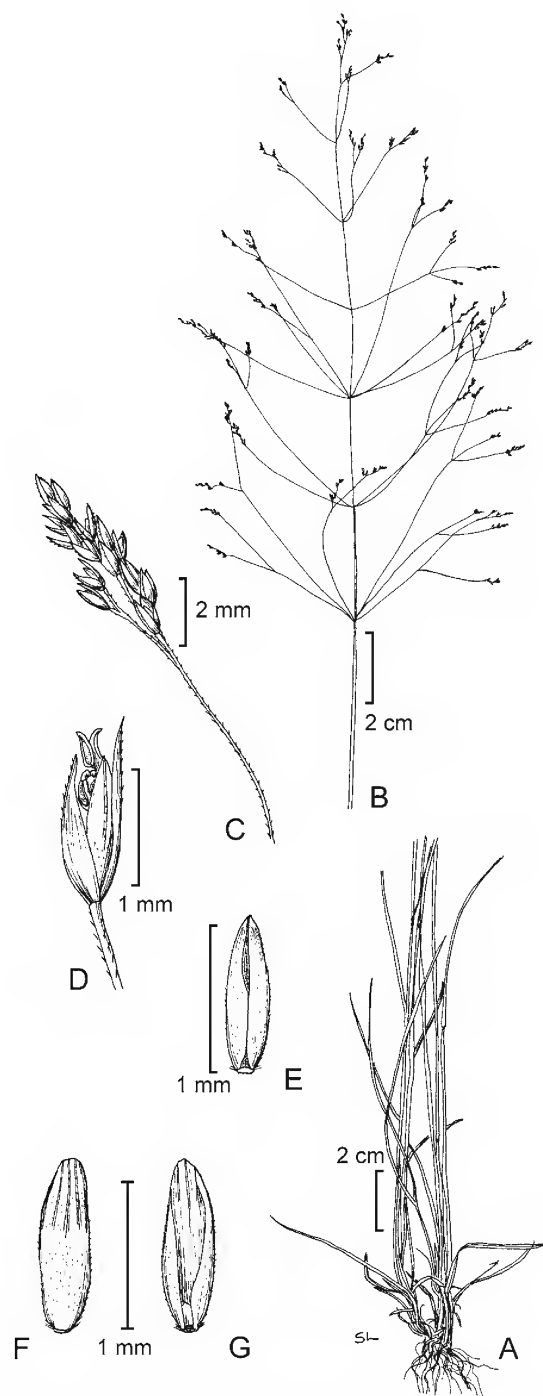


FIGURE 9. *Agrostis hyemalis*. A. Habit. B. Inflorescence. C. Inflorescence branch. D. Spikelet. E. Floret. F. Floret, dorsal view. G. Floret, ventral view. Drawn by Sandy Long; copyright Utah State University.

narrowly ovate, greenish or purplish. Glumes subequal, 1–2 mm long, 1-veined, keeled, keels scabrous, sometimes the body also scabrous toward the apex, acute to acuminate; callus hairs to 0.2 mm long, sparse; lemmas 0.8–1.2 mm long, scaberulous, translucent to opaque, 5-veined, veins obscure or prominent distally, apex usually obtuse, sometimes acute, entire, unawned; paleas absent or to 0.2 mm and thin; anthers 3, 0.2–0.5 mm. Caryopsis 0.7–1 mm.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Agrostis hyemalis* is most abundant along roadsides and in open pastures, scrub, and rocky areas. It is centered in the southeastern United States to the Caribbean, Mexico, and Ecuador.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, 1700 m, *Gentry 8027* (US); Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, P.M. *Peterson & J.M. Saarela 22059* (US). **Bocoyna:** 2 km de San Juanito rumbo [course] a Bocoyna, 14 Aug 76, bosque de pino [pine forest], 2446 m, *S. González & J.M. Peña 649* (RELC). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock 7680* (US). **Chihuahua:** Rancho el Peñasco km 150 carr. [hwy] Chihuahua–Cd. Juárez, 9 Aug 1979, pastizal mediano abierto [mostly open grassland], *M. Siqueiros 340* (MEXU). **Guerrero:** On road between Tomochic and Basaseachic, 20 mi E of jct with road S to San Juanito, 1.8 mi W of Agua Caliente, 5 Oct 1986, 2000 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8677* (NMC). **Madera:** Vicinity of Madera, 27 May–7 Jun 1908, *E. Palmer 263* (US). **Ocampo:** Near Mirador Cascada Basaseachic, 7 Sep 2008, rocky forested slopes with *Pinus*, 2022 m, P.M. *Peterson & J.M. Saarela 22080* (US).

10. *Agrostis scabra* Willd., Sp. Pl. 1(1): 370. 1797.

FIGURE 10

Perennial or annual; caespitose. Culms (7.5)15–90 cm tall, erect, nodes usually 1–3. Leaves mostly basal, basal leaves usually persistent; sheaths usually smooth, sometimes scaberulous; ligules 0.7–5 mm long, dorsal surfaces scabrous, apex usually rounded, sometimes truncate or acute, erose-ciliolate to lacerate; blades 4–14 cm long, 1–2 mm wide, basal blades mostly involute, cauline blades mostly flat. Panicles (4)8–25(50) cm long, 0.5–20 cm wide, broadly ovate, often nearly as wide as long, diffuse, the whole panicle often detaching at base when mature, forming a tumbleweed, exerted from the upper sheaths, lowest node with (1)2–7(12) branches; branches scabrous, capillary, flexible, wide-spreading, readily visible, branching beyond midlength, spikelets somewhat distant, not crowded, lower branches 4–12 cm; pedicels 0.4–9.6 mm. Spikelets lanceolate, greenish purple, frequently purple when mature. Glumes unequal, 1.8–3.4 mm long, lanceolate, 1-veined, keels scabrous at least toward the apex, apex acuminate; callus hairs to 0.2 mm long, sparse; lemmas 1.4–2 mm long, scabrous to scaberulous or smooth, translucent to opaque, 5-veined, veins prominent, apex acute to obtuse, usually entire, sometimes minutely toothed, awned or awnless from below midlength, awns 0.2–3 mm long, exceeding

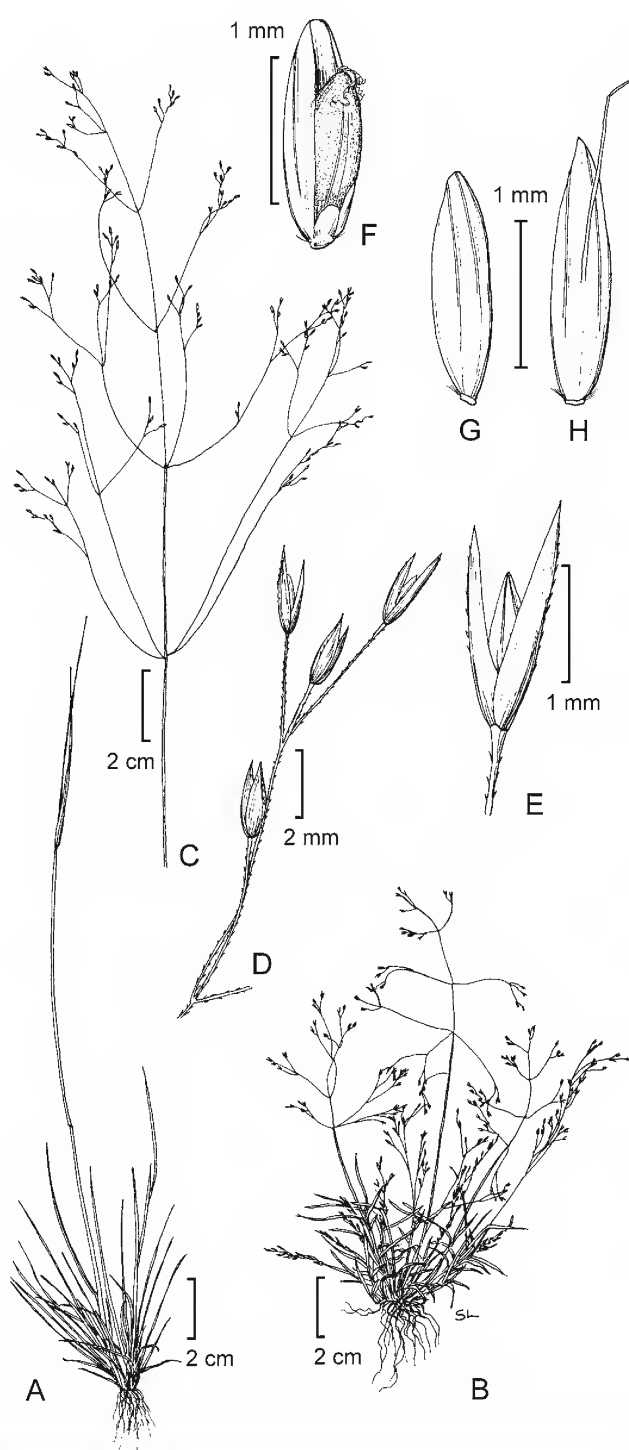


FIGURE 10. *Agrostis scabra*. A. Habit. B. Habit, dwarf form. C. Inflorescence. D. Inflorescence branch. E. Spikelet. F. Floret with caryopsis. G. Lemma, side view. H. Lemma, dorsal view. Drawn by Sandy Long; copyright Utah State University.

the lemma apex by up to 2.5 mm long, geniculate or straight, persistent; paleas absent or to 0.2 mm; anthers 3, 0.4–0.8 mm long, usually shed at anthesis. Caryopsis 0.9–1.4 mm; endosperm liquid.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Agrostis scabra* grows in grasslands, meadows, shrublands, woodlands, marshes, and stream and lake margins as well as disturbed sites such as roadsides, ditches, and abandoned pastures. It occurs in the southeastern United States to Mexico; it is also native to the Pacific coast from Kamchatka to Japan and Korea and has been introduced elsewhere (Harvey, 2007).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, slopes with pines and oaks, 1891 m, P.M. Peterson & P. Catalán 17553 (US); Rancho Byarly Sierra Charuco, 17–25 Abril [April] 1948, pine-oak forest, 5000–5800 ft, H. Scott 8027 (MEXU). **Bocoyna:** 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5864b (US); Arroyo Rituchi, 12 Sep 2003, Bye & col. 32281, 31881 (US). **Guachochi:** carr. [hwy] Guachochic–Creel km 20, 24 Sep 1981, bosque escleraciculifolio [narrow-leaved sclerophyllous forest], R. Fierros 1611 (MEXU); Creel, 2 Aug 1977, suelo húmedo & rocoso [moist and rocky soil], 2350 m, matorral de juniperos [juniper scrub], 2240 m, A. Benítez 2181 (CIIDIR, MEXU). **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20044, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Ocampo:** Basaseachi a 21 km al S de San Juanito & a 9 km al N de Creel, 16 Sep 1983, bosque de pino-encino [pineoak forest], 2150 m, Tenorio & R. Torres 4365 (MEXU); Parque Nacional Cascada de Basaseachic, 5 Aug 1994, 1950 m, C. Yen & E. Estrada 2861 (NMC); Parque Nacional “Cascada de Basaseachic,” 25 Abr 1986, 1700 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8428 (MEXU, NMC). **Temosachi:** Nabogame, 25 Mar 1988, pine-oak-cypress, 1800 m, Laferr. 1419 (MEXU). **Urique:** Cuiteco, ranchito en la cañada [glen] a 5 km de San Rafael, 21 Sep 2002, Tenorio, G. Morales & J. Rodríguez 21977, 21987 (US).

11. *Agrostis stolonifera* L. var. *palustris*\* (Huds.) Farw.

FIGURE 11

Perennial; caespitose, stoloniferous. Culms 8–40 cm tall, smooth, geniculately ascending, or decumbent, rooting from lower nodes. Sheaths glabrous; ligule 1–6 mm long, an eciliate membrane, obtuse; blades 1–10 cm long, 0.5–5 mm wide, surface ribbed, scaberulous, apex acuminate. Panicle 1–13 cm long, 0.4–2.5 cm wide, open, or contracted, linear, lanceolate or oblong, continuous or interrupted, dense or loose; primary panicle branches whorled at most nodes, scabrous. Spikelets 2–3 mm long, solitary, terete, lanceolate, or oblong, laterally compressed, fertile spikelets pedicelled, pedicels filiform, 0.5–2 mm long,



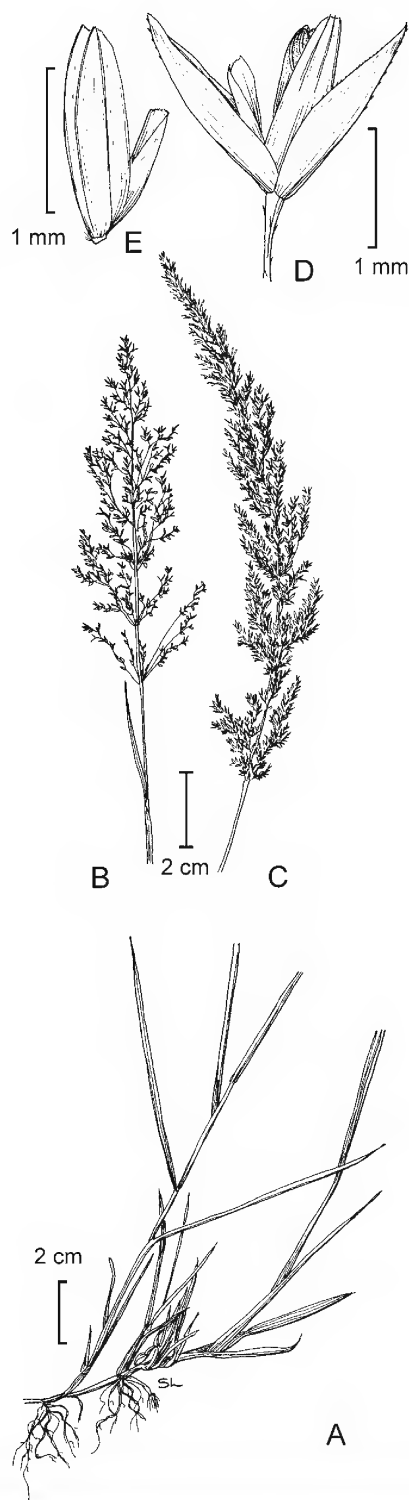


FIGURE 11. *Agrostis stolonifera*. A. Habit. B. Inflorescence. C. Inflorescence. D. Spikelet. E. Floret. Drawn by Sandy Long; copyright Utah State University.

comprising 1 fertile floret, disarticulating below each fertile floret. Glumes exceeding florets, persistent, similar, firmer than lemma, shiny, 1-keeled, 1-veined, lanceolate; lemma 1.5–2.3 mm long, elliptic to oblong, hyaline, 5-veined, apex obtuse; callus pubescent; palea 1.0–1.8 mm long, 2-veined, oblong, apex obtuse; anthers 3, 1–1.5 mm. Caryopsis with adherent pericarp, ellipsoid, isodiametric, biconvex, estipitate, smooth.

**DISTRIBUTION AND HABITAT.** *Agrostis stolonifera* var. *palustris* grows on saline soils; there exists a collection from humid depressions in gypsum areas. Native in Eurasia, it is introduced as forage in America, north of Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

12. *Agrostis subrepens* (Hitchc.) Hitchc., N. Amer. Fl. 17(7): 525. 1937.

Perennial; with delicate rhizomes. Culms 60–100 cm tall, erect, glabrous, with 2–4 nodes, the superior node near the middle of the culm. Sheaths glabrous; ligule 1–2 mm; blades 3–5 cm long, 1–1.3(1.8) mm wide, inrolled, scabrous, slender, apex hard and acute, superior blades above ½ culm. Panicle 12–18(22) cm long, 5–10 cm wide, open, pyramidal, axis glabrous, and the branches lightly scaberulous, slender, widely spread, on verticils or 1–2 per node, verticils 2–4 cm apart, lower branches 5–8 cm. Spikelets 2.5–2.8 mm long, brown to purple, grouped along the superior part of branches. Glumes 2.5–2.8 mm long, acuminate, scarcely scabrous along the keel; lemmas 1.8–2 mm long, hyaline, veinless, entire, obtuse to apiculate, awnless, callus scarcely pilous; palea rudimentary; anthers 3, 1–1.3 mm long, yellow. Caryopsis 1–1.2 mm long, ovate, flat, hard, brown.

**DISTRIBUTION AND HABITAT.** *Agrostis subrepens* grows in meadows and stream margins in Mexico and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Base of Sierra Madre, 28 Sep 1887, C.G. Pringle 1420 (US), holotype. Casas Grandes: W of Casas Grandes, just S of Hernández, 18 Sep 1960, 7000 ft, Reeder, C. Reeder & Soderstrom 3535 (US). Madera: Chuichupa, Aug–Sep 1936–37, LeSueur 087, 0198 (US); near Col. García, 1 Aug 1899, E.W. Nelson 6195 (US).

### *Alopecurus* L.

Annual or perennial; sometimes short rhizomatous, caespitose or occasionally the culms solitary. Culms erect or decumbent, occasionally cormlike at the base; nodes glabrous. Leaves inserted mostly on the lower ½ of the culms; sheaths open; ligules truncate to acute, membranous, dorsally puberulent or glabrous, entire to lacerate; blades flat or involute, glabrous or scabrous, those of the uppermost leaves sometimes short or absent. Inflorescences terminal spikelike, capitate to cylindrical; disarticulation below the glumes. Spikelets pedicellate, strongly laterally compressed, with 1 floret; rachilla prolongations absent. Glumes equaling or exceeding the florets, membranous or coriaceous, free or connate basally to more than ½ their length, 3-veined,

keeled, keels ciliate, at least basally, apex obtuse to acute or shortly awned; calluses blunt, glabrous; lemmas membranous, margins often connate basally to  $\frac{1}{2}$  their length, keeled, indistinctly 3- to 5-veined, apex truncate to acute, awned dorsally, awns arising from just above the base to about midpoint, geniculate or straight; paleas absent or greatly reduced; lodicules absent; anthers 3; ovaries glabrous; styles fused, with 2 branches. Caryopsis glabrous.  $x = 7$ .

13. *Alopecurus geniculatus*\* L., Sp. Pl. 1: 60. 1753.

FIGURE 12

Perennial; caespitose. Culms (5)10–60 cm tall, erect or decumbent, rooting at the nodes. Ligules 2–5 mm long, obtuse; blades 2–12 cm long, 1–4(7) mm wide; upper sheaths somewhat inflated. Panicles 1.5–7 cm long, 4–8 mm wide. Glumes 1.9–3.5 mm long, connate at the base, membranous, pubescent, keels not winged, ciliate, apex obtuse, parallel, often purplish; lemmas 2.5–3 mm long, connate in the lower  $\frac{1}{2}$ , glabrous or with a few scattered hairs at the apex, apex truncate to obtuse, awns 3.5–5(6) mm long, geniculate, exceeding the lemmas by (1.2)2–4 mm; anthers (0.9)1.4–2.2 mm long, yellow. Caryopsis 1–1.5 mm.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Alopecurus geniculatus* is native to Eurasia and parts of North America, growing in shallow water, ditches, open wet meadows, shores, and stream banks from the lowland to montane zones. It has been naturalized in eastern North America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Bocoyna: 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5870 (ENCB, US). Chihuahua: Bajío del Rancho Experimental La Campana, Aug 1958, Pastizal [pastureland], F. Martínez 117 (RELC, US).

### *Andropogon* L.

Annual or perennial; usually caespitose, sometimes rhizomatous. Culms 20–310 cm tall, erect, much-branched distally. Leaves not aromatic; ligules membranous, sometimes ciliate; blades linear, flat, folded, or convolute. Inflorescences terminal and axillary or a false panicle; inflorescence units 1–600 per culm; peduncles initially concealed by the subtending sheaths, sometimes exerted beyond the sheaths at maturity, with (1)2–5(13) spikes; spikes not reflexed at maturity, axes slender, terete to flattened, not longitudinally grooved, usually conspicuously pubescent, with spikelets in heterogamous sessile-pedicellate pairs (the terminal spikelets sometimes in triplets of 1 sessile and

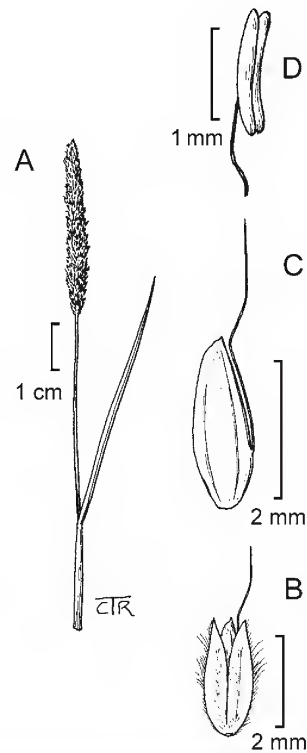


FIGURE 12. *Alopecurus geniculatus*. A. Culm and Inflorescence. B. Spikelet. C. Lemma, lateral view. D. Stamen. Drawn by Cindy Roché; copyright Utah State University.

2 pedicellate spikelets), apex of the internodes neither cupulate nor fimbriate; disarticulation in the spikes below the sessile spikelets. Sessile spikelets bisexual, awned, with short, blunt calluses; lower glumes 2-keeled, flat or concave, usually veinless between the keels, sometimes 2- to 9-veined; anthers 1 or 3(2). Pedicels usually longer than 3 mm long, similar to the same internodes in shape, length, and pubescence color, not fused to the same axes. Pedicellate spikelets usually vestigial or absent, sometimes well-developed and staminate.  $x = 10$ .

*Andropogon* is a cosmopolitan genus of tropical and temperate zones, comprising 122 species (Kellogg, 2015). The genus needs to be intensively studied since it has been found to be paraphyletic (Skendzic et al., 2007) or monophyletic (Estep et al., 2014).

### KEY TO SPECIES OF ANDROPOGON

1. Annual; upper glume of the sessile spikelets largely awned ..... *A. fastigiatus*
1. Perennial; upper glume of the sessile spikelets unawned.
  2. Sessile spikelet 3–4 mm long; hairs of rachis and pedicels much longer than on the sessile spikelets; inflorescence very branched, each branch with 2 to 3 spikes; pedicellate spikelets rudimentary, 1–2 mm long ..... *A. glomeratus*
  2. Sessile spikelets (4)6–10 mm long; inflorescence simple, with 3 to 6 spikes; pedicellate spikelets 5–7 mm long, similar to the sessile, unawned ..... *A. gerardii*

14. *Andropogon fastigiatus* Sw., Prodr. 26. 1788. *Diectomis fastigiata* (Sw.) P. Beauv., Ess. Agrostogr. 132, 160. 1812.

Annual; caespitose. Culms 30–200 cm tall. Leaves generally cauline, sheaths inconspicuously carinate at the apex; ligula 5–11 mm long, glabrous, decurrent, conspicuously veined; blades 15–35 cm long, 1–3 mm wide, scabrous or puberulent, flat, apex acuminate; inflorescences numerous, partly enclosed in the sheaths, narrow, spikes 1 per peduncle, 3–5 cm long, rachis internodes claviform; sessile spikelets 4–5 mm long, callus markedly oblique, pilose, hairs 2–3 mm; lower glume deep and narrowly sulcate, membranous, veinless, pilose between keels, unawned, upper glume carinate, navicular, largely awned, awn 10–20 mm long, divergent, not twisted on the superior half, geniculate; anthers 3, 1.5–1.8 mm; pediceled spikelets 7–8 mm long, sterile; lower glume conspicuously enlarged, flattened, with awn 6–10 mm long, geniculate with a twisted column.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Andropogon fastigiatus* grows in grasslands and pine forests. It is known from Mexico to South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: Parque Nacional Barranca del Cobre, 3.2 km S of La Bufa on road to Batopilas, tropical forest, 1050 m, P.M. Peterson, Annable & Valdés-Reyna 10860 (CIIDIR, US); Parque Nacional Barranca del Cobre, 6.7 km NE of Batopilas along the Río Batopilas at the Arroyo de Santiago, 690 m, P.M. Peterson, Annable & Valdés-Reyna 10855 (US). Guachochi: 7.4 km SW of La Bufa and 15 km NE of Batopilas, 920 m, thorn scrub vegetation, 20 Sep 1991, P.M. Peterson, Annable & Valdés-Reyna 10847 (US); Parque Nacional Barranca del Cobre, 3.8 km NE of La Bufa and 9.6 km S of Kirare, 1240 m, P.M. Peterson, Annable & Valdés-Reyna 10834 (US).

15. *Andropogon gerardii* Vitman, Summa Pl. 6: 16. 1792.

FIGURE 13

Plants often forming large clumps; rhizomes, if present, with internodes shorter than 2 cm. Culms 1–3 m tall, often glaucous. Sheaths glabrous or pilose; ligules 0.4–2.5 mm; blades 5–50 cm long, (2)5–10 mm wide, usually pilose adaxially, at least near the collar. Inflorescence units usually only terminal; peduncles with 2–6(10) spikes; spikes 5–11 cm long, exserted at maturity, usually purplish, sometimes yellowish; internodes sparsely to densely pubescent, hairs 2.2–4.2 mm long, usually white, rarely yellowish. Sessile spikelets 5–11 mm long, scabrous; awns 8–25 mm; anthers 3, 2.5–4.5 mm. Pedicellate spikelets 3.5–12 mm long, usually well-developed and staminate.  $2n = 20, 40, 60$  (usually), 70, 80, 90.

**DISTRIBUTION AND HABITAT.** *Andropogon gerardii* grows in prairies, meadows, and generally dry soils. It is a widespread species, extending from southern Canada to Mexico

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: km 2064 carr [hwy] Chih.–V. Ahumada, 21 Oct 1954, 1100 m, Hern.-Xol. & C. Tapia N-26 (US); Juárez: Sand dunes, 10–20 Oct 1935, LeSueur Mex-061 (US); aprox. 6 km al S del poblado [village] Samalayuca, 9 Sep 1995, en arenas profundas [deep sands], 1200 m, R. Corral & P. Olivas RCD6315 (UACJ).



FIGURE 13. *Andropogon gerardii*. A. Habit. B. Ligule. C. Spikelet pair. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

Matamoros: 19.3 km S of Villa Matamoros on Mex 45 to Durango, 3 Oct 1989, 1910 m, P.M. Peterson & R.M. King 8256 (US).

16. *Andropogon glomeratus* (Walter) Britton, Sterns & Poggenb., Prelim. Cat. 67. 1888.

FIGURE 14

Plants caespitose, upper portion dense, oblong to oblanceolate or obpyramidal. Culms 20–250 cm; internodes green, sometimes glaucous; branches mostly erect, straight. Sheaths usually scabrous, sometimes smooth; ligules 0.6–2.2 mm long, sometimes ciliate, cilia to 0.9 mm; blades 13–109 cm long, 2.9–9.5 mm wide, glabrous or sparsely to densely pubescent, hairs usually spreading, rarely appressed. Inflorescence units 10–600 per culm; subtending sheaths (2.0)2.9–4.4(6.5) cm long, (1.5)2.3–3.4(4.4) mm wide; peduncles (1)6–14(60) mm long, with 2(4) spikes; spikes (1)1.7–2.5(3.5) cm

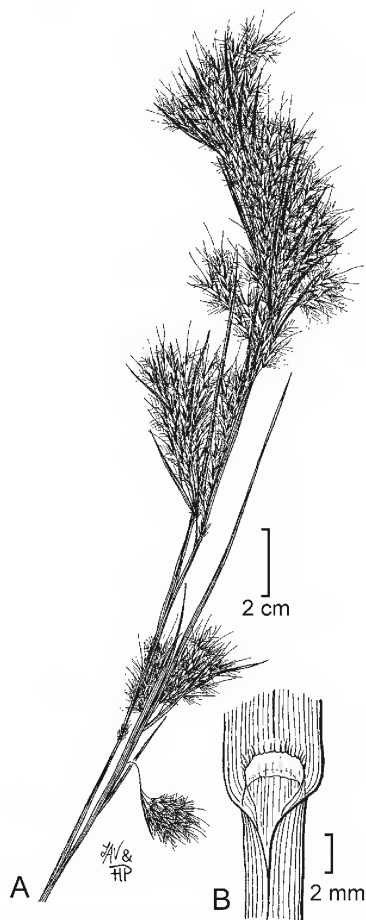


FIGURE 14. *Andropogon glomeratus*. A. Inflorescence. B. Ligule. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

long, exserted or not at maturity, pubescence sparse basally and increasing in density distally within each internode. Sessile spikelets 3–5 mm; callus hairs 1–2.5 mm; keels of lower glumes sometimes scabrous below midlength, usually scabrous distally; awns 6–19 mm; anthers 1(3), 0.5–1.5 mm long, yellow, red, or purple. Pedicellate spikelets vestigial or absent, sterile.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** This species has five varieties; only *Andropogon glomeratus* var. *pumilus* (Vasey) Vasey occurs in Chihuahua. It is weedy and grows in disturbed wet or moist sites. It is abundant and widespread, extending from the southern United States through Central America to northern South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Rio Bonito hot country, 26 Aug 1936, H. LeSueur 0100 (US). Galeana: Cerro Angostura Springs, 2.4 mi, by Mexico Highway 10, N of Angostura, 8 Oct 1982, F.W. Reichenbacher 1310 (ARIZ).

### *Anthoxanthum* L.

Annual or perennial; densely to loosely caespitose, sometimes rhizomatous; fragrant. Culms 4–100 cm tall, erect or geniculate, sometimes branched; internodes hollow. Leaves cauline or basally concentrated, glabrous or softly hairy; sheaths open, auricles absent or present; ligules membranous, sometimes shortly ciliate or somewhat erose; blades flat or rolled, glabrous or sparsely hairy. Inflorescences open or contracted panicles, sometimes spike-like. Spikelets pedicellate or sessile, 2.5–10 mm long, laterally compressed, stramineous to brown at maturity, with 3(4) florets, lowest 2 florets usually staminate or sterile, sometimes reduced to dorsally compressed lemmas, subequal to or exceeding the distal floret, distal floret bisexual; rachilla not prolonged beyond the base of the distal floret; disarticulation above the glumes, the florets falling together. Glumes unequal or subequal, equaling or exceeding the florets, lanceolate to ovate, glabrous or pilose, keeled; calluses blunt, glabrous or hairy; lowest 2 florets: lemmas strongly compressed, 3-veined, strigose, hairs brown, apex bilobed, unawned or dorsally awned; distal florets: lemmas somewhat indurate, glabrous or with hairs, shiny, inconspicuously 3- to 7-veined, unawned; paleas 1-veined, enclosed by the lemmas; lodicules 2 or absent; anthers 2 or 3. Caryopses shorter than the lemma, concealed at maturity, tightly enclosed in the floret; hila less than  $\frac{1}{3}$  the length of the caryopses, oval.  $\times = 5$ .

*Anthoxanthum* is a cool-season genus of about 50 species that grow in cool-temperate and arctic regions throughout the world. There are seven species in North America, five of which are native, and only one introduced in Chihuahua (Allred & Barkworth, 2007).

17. *Anthoxanthum odoratum*\* L., Sp. Pl. 28. 1753.

FIGURE 15

Plants perennial. Culms (10)25–60 (100) cm tall, erect, simple or sparingly branched. Auricles 0.5–1 mm long, pilose-ciliate, sometimes absent; ligules 2–7 mm long, truncate; blades 1–31 cm



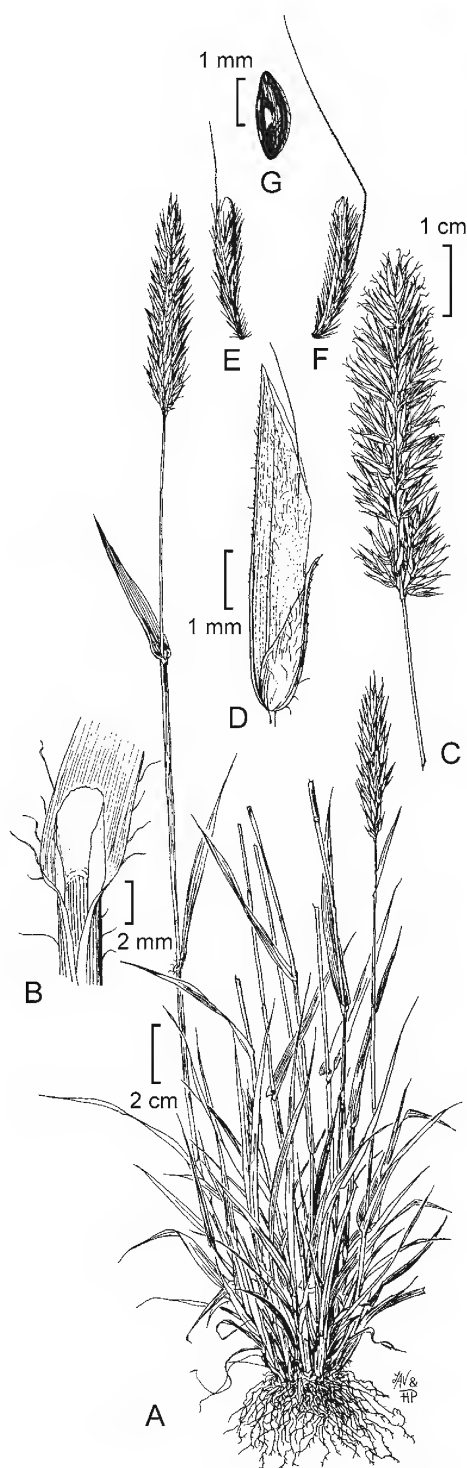


FIGURE 15. *Anthoxanthum odoratum*. A. Habit. B. Ligule. C. Inflorescence. D. Spikelet. E. Sterile floret. F. Sterile floret. G. Fertile floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

long, 3–10 mm wide. Panicles (3)4–14 cm long, the spikelets congested; lowermost branches 10–25 mm; pedicels 0.5–1 mm long, pubescent. Spikelets 6–10 mm; lower glumes 3–4 mm long, upper glumes 8–10 mm; 2 lowest florets sterile, 34 mm long, awn of the first lemma 2–4 mm long, awn of the second lemma 4–9 mm long, equaling or only slightly exceeding the upper glumes; bisexual florets 1–2.5 mm; anthers 2, (2.9)3.5–4.8(5.5) mm.  $2n = 10, 20$ .

**DISTRIBUTION AND HABITAT.** *Anthoxanthum odoratum* is native to southern Europe. In North America, it grows in meadows, pastures, grassy beaches, old hay fields, wastelands, and openings in coniferous forests (occasionally in dense shade) or as a weed in lawns. It is known from North America in Canada, the United States, and Mexico in Chiapas, Chihuahua, Coahuila, Distrito Federal, Durango, Hidalgo, México, and Oaxaca and in Central America, South America, and the Caribbean.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Herrera Arrieta and Cortés Ortiz (2010).

### ***Aristida* L.**

Plants usually perennial; herbaceous, usually caespitose, occasionally rhizomatous. Culms 10–150 cm long, not woody, sometimes branched above the base; internodes usually pith-filled, sometimes hollow. Leaves sometimes predominantly basal, sometimes predominantly cauline; sheaths open; auricles lacking; ligules of hairs or very shortly membranous and long-ciliate, the 2 types generally indistinguishable. Inflorescences terminal, usually panicles, sometimes racemes, occasionally spikes; primary branches without axillary pulvini and usually appressed to ascending, or with axillary pulvini and ascending to strongly divergent or divaricate. Spikelets with 1 floret; rachillas not prolonged beyond the florets; disarticulation above the glumes. Glumes often longer than the florets, thin, usually 1- to 3-veined, acute to acuminate; florets terete or weakly laterally compressed; caluses well-developed, hirsute; lemmas fusiform, 3-veined, convolute, usually glabrous or scaberulous, usually enclosing the palea at maturity, usually with 3 terminal awns, lateral awns reduced or obsolete in some species, lemma apex sometimes narrowed to a straight or twisted beak below the awns; awns ascending to spreading, usually straight, bases sometimes twisted together into a column or the bases of the individual awns coiled, twisted, or otherwise contorted, occasionally disarticulating at maturity; paleas shorter than the lemmas, 2-veined, occasionally absent; anthers 1 or 3. Caryopsis fusiform.  $x = 11, 12$ .

*Aristida* is a tropical to warm-temperate genus of 304 species (Kellogg, 2015).

KEY TO SPECIES OF *ARISTIDA*

1. Lateral awns of the lemma markedly reduced, generally less than  $\frac{1}{3}$  as long as the central awn.
  2. Sheaths collar densely pilose, with hairs conspicuously cobwebby and tangled, often deflexed at maturity ..... *A. gypsophila*
  2. Sheaths collar with hairs straight or somehow tangled, but not conspicuously cobwebby, generally extended.
    3. Lemma narrowing to slightly keeled, usually with an untwisted beak ..... *A. ternipes*
    3. Lemma terminating in a twisted, awn-like beak 4–6.5 mm long.
      4. Panicles open, all the primary branches with axillary pulvini; branches naked at the base ..... *A. schiedeana*
      4. Panicles closed, contracted, none of the primary branches (except occasionally the inferior ones) with axillary pulvini, then branches tightly appressed to the main axis.
        5. Lemmas 18–22(25) mm long; panicle sparsely flowered; spikelets 3–12 in total, 2(4) per branch ..... *A. spanospicula*
        5. Lemmas smaller, 10–13 mm long; panicle densely flowered, more than 16 spikelets per branch ..... *A. eludens*
  1. Lateral awns of the lemma well-developed, at least  $\frac{1}{3}$  as long as the central awn.
    6. Lemma involute, sulcate ..... *A. gibbosa*
    6. Lemma convolute, never sulcate.
      7. Lemma beak lacking or sparsely developed; annual.
        8. Lower glumes shorter than upper ones; lateral awns equal to central awn ..... *A. adscensionis*
        8. Glumes equal sized; lateral awns shorter than central awn ..... *A. longespica*
      7. Lemma beak well-developed, the twisted part 1–9 mm long, sometimes straight; perennial.
        9. Glumes markedly unequal in size, the lower less than  $\frac{3}{4}$  as long as the upper; beak less than 2 mm long, or missing.
          10. Lemma 7–12 mm long, awns subequal, (7)10–25 mm long ..... *A. pansa*
          10. Lemma 10–15 mm long, awns equal, 20–56(65) mm long ..... *A. purpurea*
        9. Glumes equal to subequal in size, the lower at least  $\frac{3}{4}$  as long as the upper; beak twisted (occasionally straight in *A. havardii*), 2–9 mm long.
          11. Panicle usually completely open, the primary branches widely divergent with axillary pulvini.
            12. Lemma beak twisted 5–9 mm long; lemma 10–12 mm long; central awn 10–20 mm long, lateral awns 3–7 mm long ..... *A. laxa*
            12. Lemma beak twisted 0.5–4 mm long; lemma 7–9 mm long; central awn 8–20 mm long, lateral awns almost equal to the central.
              13. Spikelets divergent from twigs, the pedicels with axillary pulvini; primary branches 2–6 cm long; plants delicate, 20–40 cm tall ..... *A. havardii*
              13. Spikelets and twigs plicate along the primary branches, the pedicels lacking axillary pulvini; primary branches 5–13 cm long; plants robust, 25–75 cm tall ..... *A. divaricata*
      11. Panicle narrow and contracted, at least in the distal part, the branches strongly ascending, occasionally having axillary pulvini, but only in 1–2 proximal branches.
        14. Lemma 7.5–9 mm long, the awns unequal, the central one 16–35 mm long, the lateral ones 13–25 mm long; inflorescence densely flowered, the florets overlapping ..... *A. appressa*
        14. Lemma 10–14 mm long, equal awns, 15–20 mm long; inflorescence loosely flowered, the florets not overlapping ..... *A. arizonica*

18. *Aristida adscensionis* L., Sp. Pl. 1: 82. 1753.

FIGURE 16

Plants short- to long-lived annuals. Culms (3)10–50(80) cm tall, often highly branched above the base. Leaves cauline, glabrous; sheaths shorter than the internodes, not disintegrating into threadlike fibers; ligules 0.4–1 mm long; blades 2–14 cm long, 1–2.5 mm wide, flat to involute. Inflorescences panicles, 5–15(20) cm long, 0.5–3 cm wide, often interrupted below; nodes glabrous or with straight, less than 0.5 mm hairs; primary branches 1–4 cm long, erect to ascending, without axillary pulvini, with 3–8 spikelets. Spikelets crowded. Glumes unequal,

1-veined, acuminate; lower glumes 4–8 mm; upper glumes 6–11 mm long; calluses 0.5–0.8 mm long; lemmas 6–9 mm long, slightly keeled, midveins scabrous, junction with the awns not evident; awns not disarticulating at maturity, flattened and straight to somewhat curved at base, central rib flanked by equally wide pale wings; central awns 7–15(20) mm long; lateral awns somewhat shorter, occasionally only 1–2 mm long; anthers 3, 0.3–0.7 mm long.  $2n = 22$ .

**DISTRIBUTION AND HABITAT.** *Aristida adscensionis* grows in waste ground, along roadsides, and on degraded rangelands and dry hillsides, often in sandy soils. It is associated with woodland, prairie, and desert shrub communities. Its range



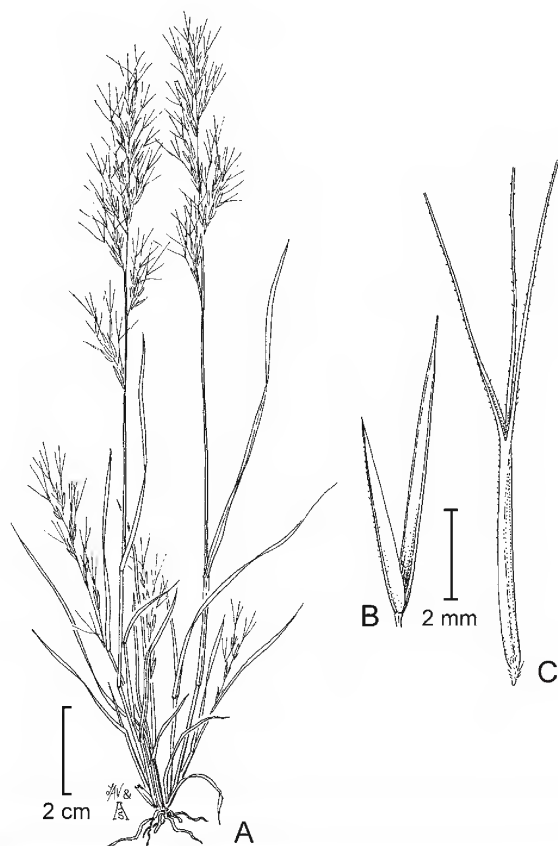


FIGURE 16. *Aristida adscensionis*. A. Habit. B. Glumes. C. Lemma. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

extends from the United States south through Mexico and Central America to South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5348 (UACJ); Arroyo del Nido Valley, 8.2 mi by dirt road, S of Mexico Highway 10, near Arroyo Plan del Alamos, 8 Oct 1982, grassland, 1300 m, F.W. Reichenbacher 1326 (ARIZ). **Aldama:** 26 (rd) mi NE of Aldama along Hwy 16 near El Morrión, 15 Sep 1972, 1100 m, J. Henrickson 7562 (NMC); San Diego de Alcalá, 20 Aug 1996, 1200 m, E. Estrada & C. Yen 5692 (NMC); Aldama, 24 Aug 1978, matorral [scrub], 1250 m, Rodríguez, Molinar 25 (MEXU); Baños de San Diego, 1.8 km E of San Diego de Alcalá, ca 16 km NE of jct of local road with 45, 14 Oct 1986, 1200 m, B. Neson & L. Vorobik 5512 (MEXU). **Allende:** Valle de Allende, entrada a la población [entrance to population], 13 Sep 1970, 1550 m, L.M. Villarreal 3662 (ENCB); 6 km al NW de Valle de Allende a un lado de la carr. [side of hwy] 45, 5 Sep

1976, pastizal [pastureland], 1670 m, E. Aldrete s/n (MEXU). **Buenaventura:** Buenaventura, 9 Sep 1975, 1850 m, J. Passini & M.F. Robert 6582 (ENCB). **Camargo:** vicinity of Colina, SW of Camargo, 6 Sep 1967, 4000 ft, Reeder & C. Reeder 4867 (ARIZ, ENCB); 23 mi S of La Perla, 6 mi E of Ojinaga–Cd. Camargo Hwy on road to Jaco, 18 Sep 1971, grassland, 1350 ft, J. Henrickson 8447 (MEXU); km 2 carret. [hwy] Camargo–Chih., 29 Sep 1995, orilla de camino [roadside], 1240 m, Ing. González 91 (MEXU). **Casas Grandes:** Arroyo Los Nogales 20 km, al S de Col. Juárez, 23 Sep 1982, 1450 m, Tenorio 1600 & Romero de T. (ENCB); Tapicetas, Casas Gdes. a Col. Juárez a la derecha [to the right], 19 Abr [Apr] 2000, pastizal, G. Gómez 25, 28 (MEXU). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Cuauhui, 9 Sep 2008, 1001 m, P.M. Peterson & J.M. Saarela 22175 (US). **Chihuahua:** Rancho Experimental La Campana, 16 Oct 1980, pastizal, 1500 m, A. Melgoza 623 (CIIDIR); entre [between] el Peñón & Minas Las Margaritas, Chihuahua, 29 Jul 1976, 1400 m, S. González & J.M. Peña 330 (ENCB); Plains near Chihuahua, 3 Sep 1935, LeSueur Mex-03 (US); Aug 1885, C.G. Pringle 390 (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, pastizal, 1463 m, Soderstrom 899 (US); La Campana Experimental Station and Rancho El Arco Iris, about 81–84 km along the Pan American hwy to Chihuahua City, Sep 1977, 1500 m, J.K. Meents W.H. Moir 101 (ENCB); Oct 1977, J.K. Meents & W.H. Moir 79 (NMC); La Campana, 4 km E carr. Panamericana, 6 Sep 1973, 1570 m, Valdés-Reyna VR-96 (ENCB, RELC); La Campana, Potrero El Plan, 1 km E carr. Panamericana, 10 Sep 1973, 1570 m, Valdés-Reyna VR-155 (ENCB); Hacienda Sta Gertrudis, criadero [hatchery] número 2 caballería Ejército Nacional [national army cavalry], 21 Sep 55, 1650 m, Hern.-Xol. & V. Mathus N-1992 (RELC). La campana: Potrero el Bajío; 11 km Ote [W], carr. Panamericana, 13 Sep 73, pastizal halófito [halophyte pastureland], 1480 m, Valdés-Reyna VR-247 (RELC); La Campana: Potrero El Plan; 1 km Ote. Carr. Panamericana, pastizal mediano abierto [mostly open pastureland], 1570 m, Valdés-Reyna VR-155 (RELC). **Delicias:** 7 mi S of Delicias along Hwy 45, 24 Sep 1972, 1250 m, Henn. 7992 (NMC). **Gómez Farías:** Laguna de Babicora, 15 km al SO [SW] de San Jose de Babicora, 26 Aug 1994, 2250 m, C. Yen & E. Estrada 3367 (NMC). **Guachochi:** Camino Guachochi–Creel, 0.5 km antes del entronque [before the junction] a la Bufo, 24 Sep 1981, bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 2700 m, M.E. Siqueiros 1633, 1643 (MEXU); steep ledges and cliffs above the river at Basiguare, a few mi off Creel–Río Urique, 19 Oct 1977, 1900 m, Bye & W.A. Weber 8330 (MEXU). **Guerrero:** Miñaca, 13 Oct 1910, Hitchcock 753, 7755 (US); S of Mesa Colorado, on S side of Arroyo Ancho, 28 Aug 1978, pinyon woodlands, 2100 m, Bye 8926 (MEXU, US). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 28 Aug 1939, 1620 m, L. H. Harvey 1635 (ENCB, US). **Jiménez:** 8 mi N of Jiménez of Mex 45, 30 Aug 1971, 4400 ft, L. H. Harvey 8895 (ENCB); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, D. Ramírez & M.L. Juárez 3375 (CIIDIR). **Juárez:** km 32 Juárez–Chih., 13 Oct 1997, matorral

de gobernadora [governor's scrub], *I. Enríquez, S. Ordoñez & J. Leyva IEA5* (UACJ). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino [oak forest], 1200 m, *A. Benítez 2907* (CIIDIR). **Meoqui:** Entre Julimes & Felipe Ángeles, 30 Jul 1976, 1310 m, *S. González & J.M. Peña 377* (ENCB). **Nuevo Casas Grandes:** 27.4 km S of Nuevo Casa Grandes on Mex 2, 28 Sep 1989, oak woods, 1585 m, *P.M. Peterson & R.M. King 8143* (ENCB, US). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7943* (ENCB, US). **Saucillo:** Mancomún El Pajarito Domingüero 18 km de las Varas, 10 Oct 1995, Matorral, 1280 m, *Fierros 109* (MEXU); Rancho El Salvador, 10 Oct 1995, matorral, 1300 m, *Fierros 116* (MEXU). **Temosachi:** Nabogame, 27 Aug 1989, forest pine-oak, 1800 m, *Laferr. 2303* (MEXU).

19. *Aristida appressa* Vasey, Contr. U.S. Natl. Herb. 1(8): 282. 1893.

Perennial; mat-forming. Culms 30–105 cm tall, erect, simple, slightly branched from the proximal nodes, glabrous. Leaves basal and cauline, straight or curved, not spirally inrolled with age; sheaths glabrous; blades 10–35 cm long, 1–3 mm wide, flat or plicate, puberulent and frequently with long hairs sparse adaxially, near the base. Panicle 10–25(30) cm long, narrow, densely flowered, the spikelets overlapping, erect, sometimes inclinate; branches 5–10 cm long, appressed, scabrous, with spikelets to the base, appressed or occasionally open. Spikelets appressed; glumes acute or short-awned, the awn 1–2 mm long, 1-veined, lower glumes (7)9–11 mm long, upper glumes 9–13 mm long, a little longer than the lower; lemmas 7.5–9 mm long, convolute, scabrous toward the apex, lemma beak 2–4 mm long, twisted, not articulate, awns 3, straight to divergent, the central 16–35 mm long, the lateral 13–25 mm long; anthers 1.3–2.3 mm long.

**DISTRIBUTION AND HABITAT.** *Aristida appressa* grows in grasslands in oak and desert shrub communities. Its range extends from Mexico to Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** km 10 del entronque [junction] a Casas Grandes carr. [hwy] Chih–Cd. Juárez, 8 Aug 1979, pastizal [pastureland], 1525 m, *Serrato 270* (MEXU). **Balleza:** 43.5 km W of Balleza and 51.6 km E of Guachochi, 18 Sep 1991, bosque de pino [pine forest], 2320 m, *P.M. Peterson, Annable & Valdés-Reyna 10762* (CIIDIR, US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 18 Sep 1991, pinyon woodlands, 2480 m, *P.M. Peterson, Annable & Valdés-Reyna 10771* (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer 5* (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, slopes with pine-oaks, 1891 m, *P.M. Peterson & Catalán 17540* (US). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock 7709* (US); S of San Ignacio Arareco near Creel airstrip, 9 Aug 1972, pine-oak forest, 7200 ft, *Bye 2698* (MEXU). **Buenaventura:** Buenaventura, 28 Sep 1981, pastizal, 1460 m, *A. Baray 1699* (MEXU); Ejido El Apache, 28 Sep 1981, pastizal, 1460 m, *A. Baray 1713* (MEXU). **Cuauhtémoc:** Rancho Las Carretas,

acceso [access] de Chihuahua hacia [toward] Namiquipa, desviar en [divert in] “campo 73” a la izquierda terac. [left dirt road] 12 km, 7 Oct 2000, Bosque de encino–pino [oak–pine forest], *G. Gómez 206* (MEXU). **Guachochi:** Just south of Napuchis, 2 Sep 2003, grassland, 2162 m, *P.M. Peterson & P. Catalán 17662* (US); Cusarare, at Km 24 south of Creel, 17 Sep 1973, pine-oak forest, *Bye 5170* (MEXU). **Guerro:** 24 mi SW of La Junta on road to Creel, 2270 m, *P.M. Peterson & Annable 9611* (US); 40.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 29 Sep 1989, 2390 m, *P.M. Peterson & R.M. King 8189* (US); Tomochi, 2 km alrededor del poblado [around the village], 24 Sep 1997, bosque de pino, 2100 m, *M.A. Vergara 146* (MEXU); carr. la Junta–San Juanito, 17 km. 22 Sep 1997, 2290 m, *B. Tab V. 17* (MEXU). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1450 m, *L. H. Harvey 1593* (ENCB). **Madera:** Mesa del Yerbanís, ejido El Largo, 12 Oct 1990, bosque de encino, 1900 m, *O. Bravo 1846* (CIIDIR, MEXU); Col. García, 2 Sep 1990, pastizal, 2240 m, *A. Benítez 2193* (CIIDIR). **Matamoros:** 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 22 Sep 1991, 1900 m, *P.M. Peterson, Annable & Valdés-Reyna 10872* (US). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7952* (ENCB, US).

20. *Aristida arizonica* Vasey, Bull. Torrey Bot. Club 13(2): 27. 1886.

FIGURE 17

Perennial; usually caespitose, occasionally with rhizomes. Culms 30–80(100) cm long, erect, unbranched. Leaves mostly basal; sheaths usually longer than the internodes, mostly glabrous, throat sometimes with hairs, not disintegrating into threadlike fibers; collars glabrous or with hairs at the sides; ligules 0.2–0.4 mm long; blades 10–25(30) cm long, 1–3 mm wide, usually flat, often curling like wood shavings when mature, glabrous. Inflorescences spike-like panicles, 10–25 cm long, 1–3 cm wide, loosely flowered, the spikelets not overlapping; nodes glabrous or with straight, about 0.5 mm, hairs; primary branches 2–6 cm long, appressed, without axillary pulvini, with 2–8 spikelets. Glumes 10–15(18) mm long, brownish, acuminate to awned, awns to 3 mm; lower glumes slightly shorter than to equaling the upper glumes, 1- to 2-veined; calluses 1–1.8 mm; lemmas 12–18 mm long, glabrous, rarely sparsely pilose, terminating in a 3–6 mm twisted column, junction with the awns not conspicuous; awns 20–35 mm long, straight to curved basally, ascending distally, not disarticulating at maturity; central awns 20–35 mm; lateral awns slightly shorter than the central awns; anthers 3, 1.3–1.9 mm long.  $2n = 22$ .

**DISTRIBUTION AND HABITAT.** *Aristida arizonica* grows in pine, pine-oak, and pinyon-juniper woodlands from the southwestern United States to southern Mexico. It may be confused with *A. purpurea* var. *nealleyi* but differs in having flat, curly leaf blades and longer awns.

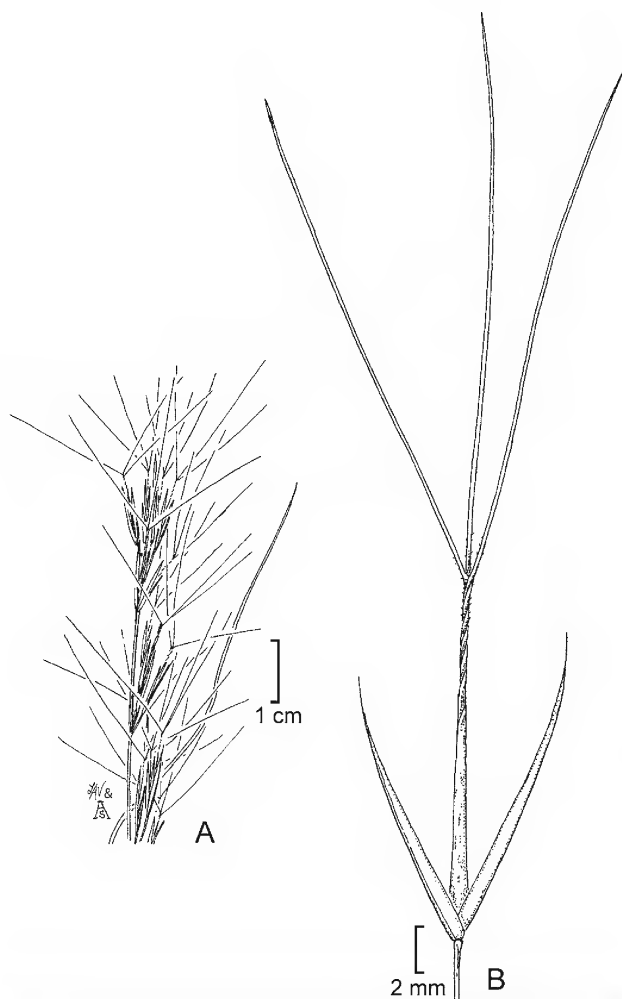


FIGURE 17. *Aristida arizonica*. A. Inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7717 (US). **Guachochi:** km 70 carr. [hwy] Balleza-Guachochi, 24 Sep 1981, bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 2650 m, *M.E. Siqueiros* 1597 (MEXU). **Guadalupe y Calvo:** Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, *P.M. Peterson* 20073, *F. Sánchez Alvarado* & *E.P. Gómez Ruíz* (CIIDIR, US). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7752, 7764 (US); 78 km de la Junta a Basaseachic, 10 Oct 1981, bosque esclerófilo caducifolio, 1230 m, *R. Fierros* 1699 (MEXU). **Hidalgo del Parral:** 14 mi E of Parral, 6 Sep 1967, 5300 ft, *Reeder* & *C. Reeder* 4878 (ARIZ, ENCB). **Ignacio Zaragoza:** Ejido de León, Ignacio Zaragoza, 12 Sep 1975,

2100 m, *J. Passini* & *M.F. Robert* 6731 (ENCB). **Madera:** Chuhi-chupa, Aug–Sept 1936, *LeSueur Mex* 0113 (MEXU, US). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, *P.M. Peterson* & *Annable* 5986 (ENCB, US).

21. *Aristida divaricata* Humb. & Bonpl. ex Willd., Enum. Pl. 1: 99. 1809.

FIGURE 18

Perennial; caespitose. Culms 25–70 cm tall, erect or prostrate, unbranched or sparingly branched. Leaves tending to be basal; sheaths longer than the internodes, glabrous except at the summit; collars densely pilose; ligules 0.5–1 mm long; blades 5–20 cm long, 1–2 mm wide, flat to loosely involute, glabrous. Inflorescences paniculate, 10–30 cm long, 6–25 cm wide, peduncles flattened and easily broken; rachis nodes glabrous or with hairs, hairs to 0.5 mm; primary branches 5–13 cm long, stiffly divaricate to reflexed, with axillary pulvini, usually naked on the basal ½; secondary branches usually well-developed. Spikelets overlapping, usually appressed, sometimes divergent and the pedicels with axillary pulvini. Glumes 8–12 mm long, 1-veined, acuminate or shortly awned, awns to 4 mm; calluses about 0.5 mm; lemmas 8–13 mm long, the terminal 2–3 mm with 4 or more twists when mature, narrowing to 0.1–0.2 mm wide just below the awns, junction with the awns not evident; awns (7)10–20 mm long, not disarticulating at maturity; central awns almost straight to curved at the base, ascending to somewhat divergent distally; lateral awns slightly thinner and from

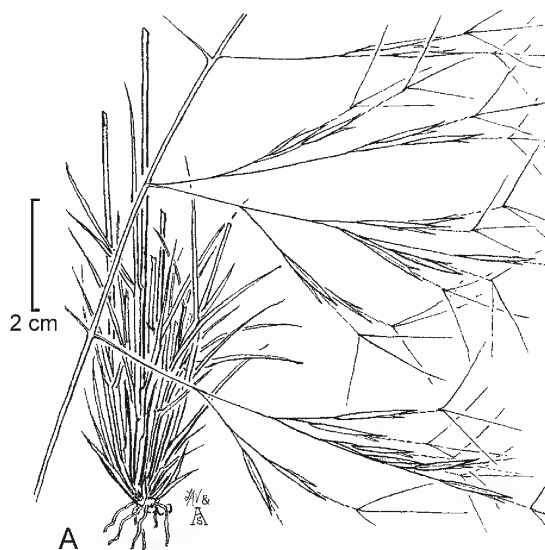


FIGURE 18. *Aristida divaricata*. A. Habit. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

much to slightly shorter than the central awns, ascending to divergent; anthers 3, 0.8–1 mm long. Caryopsis 8–10 mm long, light brown.  $2n = 22$ .

**DISTRIBUTION AND HABITAT.** *Aristida divaricata* grows on dry hills and plains, especially in pinyon-juniper-grassland zones, from the southwestern United States through Mexico to Guatemala. It occasionally intergrades with *A. havardii*, but that species has lemma beaks that are straight or have only 1–2 twists, shorter primary branches, usually no secondary branches, and pedicels that more frequently have axillary pulvini so the spikelets are more frequently divergent than in *A. divaricata*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 5 km al N de Flores Magón, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5380 (UACJ); aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6469 (UACJ). **Aldama:** Aldama, 24 Aug 1978, 1250 m. *Molinar-Baray* 26 (MEXU). **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on MEX 432, near Corral de Duarte, 18 Sep 1991, bosque de pino-encino [pine-oak forest], 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10719 (CIIDIR, US); 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, matorral xerófilo [xerophilous scrub], P.M. Peterson, Annable & Valdés-Reyna 10740 (CIIDIR, US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20019, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Urique crossing, towards Basihuare and Creel, 6 Sep 2008, slopes with pines and oaks, 1890 m, P.M. Peterson & J.M. Saarela 22064, 22065 (US); entre [between] Kirare & la Bufa, 18 Jul 1984, selva baja caducifolia [low deciduous forest], 600–1000 m, Tenorio et al 6584 (MEXU). **Bocoyna:** Sánchez, along the railway 12 Oct 1910, Hitchcock 7730 (US). **Chihuahua:** La Campana Experimental Station and Rancho El Arco Iris, about 81–84 km, Sep 1977, 1500 m, J.K. Meents & W.H. Moir 81, 89 (ENCB), 75 (NMC); Rocky hills near Chihuahua, 13 Aug 1885, C.G. Pringle 387 (US); Mts W of Chihuahua, 20 Oct 1935, *LeSueur Mex-068* (US); La Campana: Potrero El Plan 1 km Pte. Carr. [hwy] Panamericana, 10 Sep 73, pastizal [pastureland], 1570 m, Valdés-Reyna VR-156 (RELC). **Coyame:** 21 km SW of Coyame on the Chihuahua Hwy on SE, flank of Sierra de la Escudida, 22 Oct 1972, Isotál, 1400 m, T.L. Wendt, F. Chiang & M.C. Johnston 9842 (MEXU). **Cuauhtémoc:** 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9600 (US). **Gral. Trias:** 2.8 mi W of General Trias on Rte. 16, 21 Aug 1979, 1780 m, W.L. Wagner & J.C. Solomon 4336 (MEXU). **Gómez Farías:** Laguna de Babicora, 15 km al SO [SW] de San Jose de Babicora, 26 Aug 1994, 2250 m, C. Yen & E. Estrada 3451 (NMC). **Guachochi:** 1–2 km S of Rio Osichi and Rio Basihuare jct., 1 Sep 2003, slopes with oaks and pines, 1600 m, P.M. Peterson & P. Catalán 17635 (US). **Guerrero:** Miñaca, 13 Oct 1910, Hitchcock 7754, 7761 (US); carr. La Junta-San Juanito, 17 km, 22 Sep 1997, 2290 m, B. Tab V. 4 (MEXU). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23,

28 Sep 1989, pine woods, 2400 m, P.M. Peterson & R.M. King 8155 (ENCB, US). **Manuel Benavides:** 1 mi E of Pozo de Villa along road from Ojinaga to Castillon, via La Mula, Trincheras, Piramide and San Salvador, 10–12 Aug 1941, I.M. Johnston 8177 (MEXU). **Matamoros:** 18.2 km SE of Villa Matamoros on Mex 45 to Durango, 1780 m, P.M. Peterson, Annable & Valdés-Reyna 10867 (US); 19.3 km S of Villa Matamoros on hwy 45 to Durango, 3 Oct 1989, grassland, 1910 m, P.M. Peterson & R.M. King 8254 (US). **Namiquipa:** Rancho Las Carretas, acceso de [access from] Chihuahua hacia [toward] Namiquipa, 10 Oct 2000, bosque de pino-encino, G. Gómez 237 (MEXU), 2100 m; Rancho Tepehuanes, acceso de Chihuahua hacia Namiquipa, 11 Oct 2000, pastizal, G. Gómez 303,313 (MEXU); Rancho Aguja, acceso de Chihuahua hacia Namiquipa, 13 Oct 2000, pastizal, G. Gómez 327 (MEXU).

22. *Aristida eludens* Allred & Valdés-Reyna, Novon 5: 209–222. 1995.

Perennial; mat-forming. Culms 35–65(80) cm tall, erect, branched from the base, glabrous. Sheaths glabrous or scaberulous, rounded, collar with a lock of hairs at the edges, occasionally with a row of small hairs dorsally crossing; ligule 0.2–0.3 mm long, a ring of hairs; blades 12–35 cm long, 1–1.5 mm wide, flat or partially plicate when young, inrolled when mature, glabrous or scaberulous. Panicle 10–22 cm long, 1–2 cm wide, with more than 16 spikelets, narrow, contracted, nodes glabrous; branches 5–9 cm long, divaricate, erect, appressed to the main axis, spikelets from the base. Spikelets appressed, occasionally present in the inferior axils. Glumes glabrous, brown, subequal, 1-veined, 8–13 mm long, the apex acute and often with a mucro; lemma 10–13 mm long, glabrous, mottled, awn beak 3–5 mm long, twisted, central awn 5–10 mm long, geniculate, not twisted, lateral awns highly reduced, erect, 0.1–3 mm long, callus 0.5–1 mm long, with stiff hairs to 1 mm; paleas completely enclosed by the lemma, hyaline; anthers 0.8–1 mm long. Caryopses 6–8 mm long, fusiform, brown.

**DISTRIBUTION AND HABITAT.** *Aristida eludens* grows on grasslands over calcareous soils. It is known from Mexico in Chihuahua, Coahuila, Durango, Guanajuato, Nuevo León, Oaxaca, Querétaro, and San Luis Potosí.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino [pine forest], 1891 m, P.M. Peterson & P. Catalán 17536 (US).

23. *Aristida gibbosa* (Nees) Kunth, Enum. Pl. 1: 189. 1833. *Chaetaria gibbosa* Nees, Fl. Bras. Enum. Pl. 2: 383. 1829.

Perennial; caespitose. Culms 50–95 cm tall, erect, simple, glabrous. Basal leaves markedly spirally inrolled when mature, cauline generally straight or curved; sheaths glabrous; blades 15–25 cm long, 1–2 mm wide, flat, plicate near the apex, glabrous abaxially, densely puberulent occasionally with spaced hairs adaxially. Panicle 10–30 cm long, narrow but somewhat open, branches ascending, scabrous, with spikelets from the base,



pedicels ascending. Glumes 1-veined, the lower 7.5–9.5 mm long, scabrous on the keel, shortly awned, the upper 7–8 mm long, glabrous, acuminate; lemma 6–7.6 mm long, involute, conspicuously sulcate, glabrous, awn beak 1–4 mm long, twisted, not articulate, awns 3, erect to divergent, the central 9–14 mm long, the lateral 6–12 mm long; callus 0.2–0.4 mm long, obtuse, pillose, the hairs 0.5–0.7 mm long; anthers 1.6–2.3 mm long.

**DISTRIBUTION AND HABITAT.** *Aristida gibbosa* ranges from Mexico to Central America, South America, and the Caribbean.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, P.M. Peterson, Annable & Valdés-Reyna 10793 (US). **Uruachi:** Guazaremos, Río Mayo, 26 Sep 1935, Gentry 1873 (US).

24. *Aristida gypsophila* Beetle, Phytologia 49(1): 36–37. 1981.

FIGURE 19

Perennial. Culms 45–80 cm tall, erect, usually unbranched. Leaves basal and cauline; sheaths longer than the internodes, glabrous except at the summit; collars densely pilose, hairs 1–3 mm long, cobwebby and tangled, often deflexed; ligules less than 0.5 mm long; blades 5–15 cm long, about 0.5 mm wide, usually involute, occasionally loosely folded, glabrous, light green. Inflorescences paniculate, 12–20 cm long, 2–8 cm wide; primary branches 2–5 cm long, erect to horizontal, with or without axillary pulvini, with 1–5 spikelets. Spikelets appressed or with axillary pulvini and spreading. Glumes 6–10(12) mm long, equal or the lower glumes slightly shorter, 1-veined, brownish; calluses about 0.5 mm; lemmas (6)7–14(16) mm long, mostly smooth, mottled, terminating in a 2–4 mm long, usually twisted, scabrous beak; central awns 5–10 mm long, sharply curved at the base, spreading distally; lateral awns absent or to 3 mm long, erect; anthers 3, about 1.5 mm long, brown. Caryopsis 5–8 mm long.

**DISTRIBUTION AND HABITAT.** *Aristida gypsophila* grows on rocky limestone or gypsum hills in thorn scrub communities of the Chihuahuan Desert, almost always growing in the protection of shrubs. It is very similar to *A. pansa*, which differs in having 3 well-developed awns and being, usually, shorter in stature. Both species have involute blades with a characteristic tuft of cobwebby hairs at the collar.

There exist three recognized forms of this species, and two are present in Chihuahua.

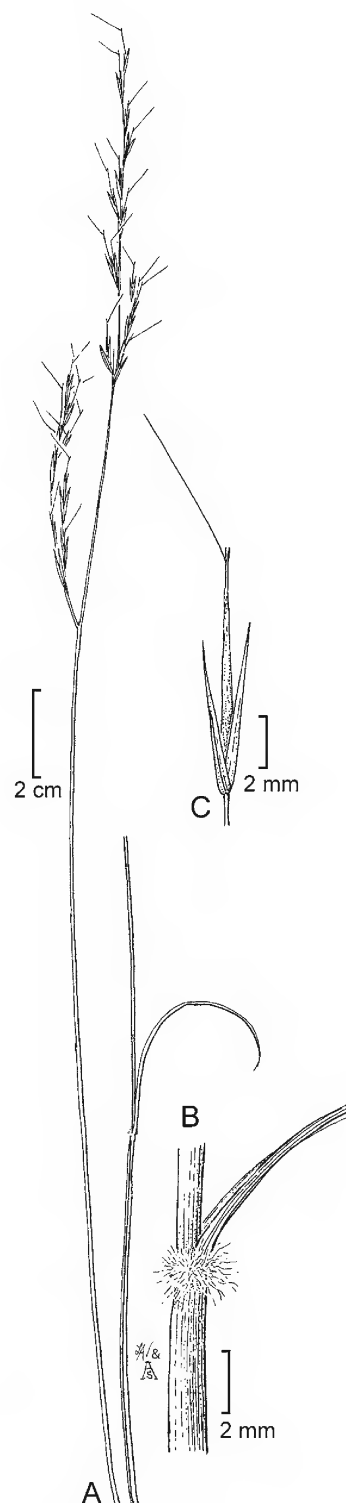


FIGURE 19. *Aristida gypsophila*. A. Culm and inflorescence. B. Sheath, collar, and blade. C. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

KEY TO FORMS OF *ARISTIDA GYPSOPHILA*

1. Axillary pulvini absent; panicle contracted ..... *A. gypsophila* fo. *diffussa*  
 1. Axillary pulvini present; panicle branches extended, at least the primary ones ..... *A. gypsophila* fo. *gypsophiloides*

*Aristida gypsophila* fo. *diffussa* Allred & Valdés-Reyna, Brittonia 49(1): 65. 1997.

Known only from Mexico (Chihuahua, San Luis Potosí).

SPECIMENS EXAMINED. MEXICO. Chihuahua.

**Jiménez:** Sierra Las Pampas, N end of the sierra along dirt rd from Las Pampas to jct with rd to Camargo, 23 Sep 1992, matorral xerófilo [xerophilous scrub], 1400 m, *Allred & Valdés-Reyna* 5815 (NMC).

*Aristida gypsophila* fo. *gypsophiloides* Allred & Valdés-Reyna, Brittonia 49(1): 65. 1997.

Known from the United States to Mexico in Chihuahua, Coahuila, and San Luis Potosí.

SPECIMENS EXAMINED. MEXICO. Chihuahua.

**Jiménez:** Sierra Las Pampas, N end of the sierra, from Las Pampas to Camargo, 6.2 mi SE of jct, 23 Sep 1992, matorral xerófilo [xerophilous scrub], 1370 m, *Allred & Valdés-Reyna* 5804 (NMC) Holotipo; Sierra Las Pampas, N end of the sierra along dirt rd from Las Pampas to jct with rd to Camargo, 23 Sep 1992, matorral xerófilo, 1400 m, *Allred & Valdés-Reyna* 5810, 5812 (NMC); N end of Sierra Las Pampas, 11.5 km NW of Las Pampas on rd to Camargo, 24 Aug 1972, *Chiang & A. Lott* 8805 (MEXU).

25. *Aristida havardii* Vasey, Bull. Torrey Bot. Club 13(2): 27.1886.

FIGURE 20

Perennial; caespitose. Culms 15–40 cm tall, slender, usually erect, occasionally decumbent, often tightly clustered into hemispheric clumps, unbranched. Leaves mostly basal; sheaths longer than the internodes, glabrous except at the summit; collars densely pilose; ligules 0.5–1 mm long; blades 5–20 cm long, 1–2 mm wide, flat to loosely involute, glabrous. Inflorescences paniculate, 8–18 cm long, 4–12 cm wide, peduncles often flattened and easily broken; rachis nodes glabrous or with straight, less than 0.3 mm, hairs; primary branches 2–6 cm long, stiffly divaricate to reflexed, with axillary pulvini, usually naked on the lower ½; secondary branches usually absent. Spikelets usually divergent, pedicels usually with axillary pulvini. Glumes 8–12 mm long, 1-veined, acuminate or awned, awns to 4 mm long; calluses about 0.5 mm long; lemmas 8–13 mm long, glabrous, smooth or scabrous, terminal 2–3 mm straight or with 1–2 twists, narrowing to 0.1–0.2 mm wide, junction with the awns not evident; awns (7)10–22 mm long, not disarticulating at maturity, from almost straight to somewhat curved basally, ascending to divergent distally; lateral awns slightly shorter and thinner than the central awns; anthers 3, 0.8–1 mm long. Caryopsis 8–10 mm long, light brown.  $2n = 22$ .

**DISTRIBUTION AND HABITAT.** *Aristida havardii* grows on dry hills and plains in desert grassland to pinyon-juniper zones, and in sandy to rocky ground, from the southwestern United States to northern Mexico. It occasionally intergrades with *A. divaricata*, but that species differs in having more twisted lemma beaks, longer primary branches, well-developed secondary branches, and, usually, appressed spikelets.

SPECIMENS EXAMINED. MEXICO. Chihuahua. **Ahumada:** 1 km al Pte Sueco; carr. [hwy] Sueco–Buenaventura,



FIGURE 20. *Aristida havardii*. A. Habit. B. Glumes. C. Lemma. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.



23 Oct 74, pastizal [pastureland], 1300 m, *Valdés-Reyna VR-726a* (RELC); 7 km W carr. Sueco–Buenaventura, 23 Oct 1974, pastizal, 1300 m, *Valdés-Reyna & M.L. Yeomans VR-726* (ENCB); 10 km W carr. Sueco–Buenaventura, 23 Oct 1974, pastizal, 1300 m, *Valdés-Reyna & M.L. Yeomans VR-726* (ENCB). **Aldama:** Aldama, 24 Aug 1978, matorral [scrub], 1250 m, *Molinar-Baray 26b* (MEXU); km 50 carr. Chihuahua–Ojinaga, 24 Aug 1978, matorral, 1250 m, *R. Gutiérrez 19* (MEXU). **Casas Grandes:** Sur de Colmenas, 23 Oct 74, Matorral de *Prosopis–Acacia*, 1250 m, *Valdés-Reyna VR-745* (RELC). **Chihuahua:** 6 km al S de Chihuahua, carr. Chihuahua–Delicias, 17 Aug 1996, 1450 m, *E. Estrada & C. Yen 5431* (NMC); Sacramento, 21 Jul 1976, pastizal, 1570 m, *Gómez-Blanco 34* (MEXU). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, *P.M. Peterson & Annable 5967* (ENCB). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, *L. H. Harvey 1602* (US). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, *T. Lebgue, G. Quintana & E. Estrada 3763* (NMC). **Namiquipa:** Rio Santa Clara Valley. 3.1 mi, by dirt road to San Lorenzo, N of Ortega, 10 Oct 1982, grassland, 1350 m, *F.W. Reichenbacher1373* (ARIZ).

**26. *Aristida laxa* Cav., Icon. 5: 44–45, t. 470, f. 1. 1799.**

Perennial; with strong roots. Culms 40–60(100) cm tall, erect, simple. Leaves basal and cauline, persistent and spirally twisted with age; sheaths glabrous; blades 1–30 cm long, 2–2.5 mm wide, flat toward the base, involute toward the apex, glabrous abaxially, with long hairs adaxially. Panicles 20–35 cm long, pyramidal, open, branches long, spreading to inclinate, scabrous, branched below the half, naked at the base; pedicels appressed. Spikelets 2.3–2.6 mm including the awns. Glumes subequal, 1-veined, the lower 9–12 mm long, scabrous, narrow-apiculate, brown, the upper 10–12 mm long, glabrous; lemma 10–12 mm long, convolute, glabrous, apiculate, beak awn 5–9 mm long, twisted, not articulate, awns 3, straight, the central 10–20 mm long, the laterals 3–7 mm long; anthers 1.2–1.6 mm long.  $2n = 44$ .

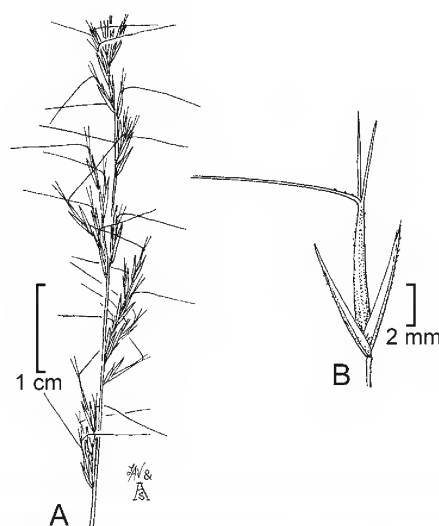
**DISTRIBUTION AND HABITAT.** *Aristida laxa* grows on open areas of the pine and oaks forests. It is known from Mexico. There are three varieties of this species; in Mexico, *Aristida laxa* var. *laxa* is found.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Namiquipa:** at Rancho Teseachic, Mar 1974, rocky hills, *A.A. Beetle M-3274* (MEXU). **Guachochi:** 21.8 km al SW de la desviación a [deviation to] La Bufa, 22 km al S de Humira, 17 Sep 1983, bosque de pino–encino [pine–oak forest], 2070 m, *R. Torres et al. 3675* (MEXU).

**27. *Aristida longespica* Poir., Encycl. Suppl. 1: 452. 1810.**

FIGURE 21

Annual. Culms 15–65 cm long, erect to spreading, often geniculate-based, sometimes nearly prostrate, usually much-branched. Leaves cauline; sheaths shorter than the internodes,



**FIGURE 21.** *Aristida longespica*. A. Inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

not disintegrating into threadlike fibers at maturity, glabrous or sparsely pilose, hairs on the throat sometimes to 5 mm; collars glabrous; ligules about 0.5 mm long; blades 5–14 cm long, 1–2 mm wide, flat to loosely involute, light green. Inflorescences usually paniculate, occasionally racemose or spicate, 6–22 cm long, 1–4(6) cm wide; nodes glabrous or with straight hairs, hairs to 0.3 mm; primary branches 1–4 cm long, appressed to erect, rarely somewhat spreading distally, without axillary pulvini, with 2–5 spikelets per branch. Spikelets widely spaced to crowded. Glumes subequal, 2–11 mm long, 1-veined, acuminate, unawned or awned, awns to 1 mm; calluses less than 1 mm; lemmas 2.5–10 mm long, gray to dark purplish-brown, often horizontally banded or mottled, scabrous-hirsute or glabrous, not beaked, apex only slightly narrowed, junction with the awns not evident; awns usually unequal, terete and curving up to 100° at the base, erect to reflexed distally, not disarticulating at maturity; central awns 1–27 mm; lateral awns absent or to 18 mm long, shorter than the central awns; anthers 1 and 0.2–0.3 mm long, or 3 and 3–4 mm long. Caryopsis 3–4 mm long, light brown.

**DISTRIBUTION AND HABITAT.** *Aristida longespica* grows along roadsides and in waste places, sandy fields, and clearings in pine and oak woods of southern Ontario and the eastern and central United States to Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela 22150* (US); 2.1 mi W of Curahui on road towards Saguarivo, 1328 m, open woods with pines and oaks, 9 Sep 2008, *P.M. Peterson & J.M. Saarela 22158* (US).

28. *Aristida pansa* Wooton & Standl., Contr. U.S. Natl. Herb. 16: 112. 1913.

FIGURE 22

Perennial; caespitose. Culms 20–60(75) cm tall, erect, unbranched. Leaves basal and cauline; sheaths usually longer than the internodes, glabrous except at the summit; collars densely pilose, hairs 1–3 mm long, cobwebby and tangled, often deflexed; ligules less than 0.5 mm long; blades 4–28 cm long, less than 1 mm wide, usually involute, infrequently flat, usually arcuate, abaxial surfaces glabrous, adaxial surfaces glabrous or puberulent near the base, scabrous or puberulent distally. Inflorescences paniculate, 10–20 cm long, 3–10(12) cm wide; rachis nodes usually glabrous, sometimes with straight, less than 0.3 mm, hairs; primary branches 2–11 cm long, stiffly ascending to spreading, with axillary pulvini; secondary branches and pedicels with or without pulvini; terminal spikelets often divergent. Spikelets clustered on the distal ½ of the branches. Glumes equal or subequal, 1-veined, acuminate or awned, awns to 6 mm long, brownish; lower glumes 5–10 mm; upper glumes 6–12 mm; calluses 0.5–1 mm; lemmas 7–13 mm long, terminating in an obscure, narrow beak 1–4 mm long, 0.1–0.2 mm wide, junction with the base of the awns not evident; awns 6–15 mm long, not disarticulating at maturity, central and lateral awns similar in length and thickness, spreading to horizontal; anthers 3, 1–3 mm long, brown. Caryopsis 6–8 mm long, tan.

**DISTRIBUTION AND HABITAT.** *Aristida pansa* grows in desert scrub, commonly in the Chihuahuan Desert of the southwestern United States and Mexico, but its ecological range extends into the lower juniper zones and its geographic range to southern Mexico. It has been confused with *A. purpurea* var. *perplexa*, which differs in having reddish glumes of unequal length and longer ascending awns.

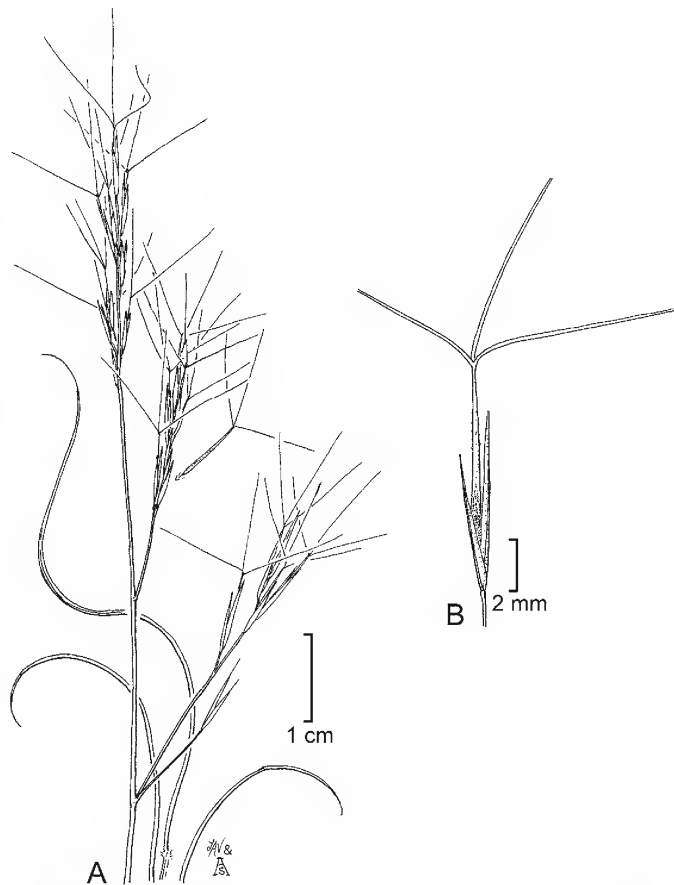


FIGURE 22. *Aristida pansa*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

#### KEY TO FORMS OF ARISTIDA PANSA

1. Axillary pulvini present only on primary branches of the panicle; secondary branches and spikelets appressed to the primary branches . . . . . *A. pansa* fo. *pansa*
1. Axillary pulvini present on all branches and pedicels; spikelets widely spreading from the branches . . . . . *A. pansa* fo. *dissita*

*Aristida pansa* fo. *dissita* (I. M. Johnston) Allred & Valdés-Reyna, Brittonia 49(1): 62. 1997. *Aristida dissita* I. M. Johnston, J. Arnold Arbor. 24(4): 401–402. 1943.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** km 5 on road to Casas Grandes from hwy to Cd. Juárez, 19 Sep 1955, matorral xerófilo [xerophilous scrub], 1350 m, *Hern.-Xol* 1916 (NMC). **Chihuahua:** Hills and plains near Chihuahua, 13 Oct 1885, C.G. Pringle 388 (US) Isotype; km 1773 carr. [hwy] a Cd. Juárez, 15 Sep 55, pradera con encinos dispersos [meadow with scattered oaks], 1500 m, *Hern.-Xol* & V. Mathus N-1800 (RELC). **Guachochi:** Flat rock outcrops at Napuchis, 2 Sep 2003, grassland, 2140 m, P.M. Peterson & P. Catalán 17675 (US). **Jiménez:** along hwy 45 from Jiménez to

Parral, 7.2 mi W of Jiménez, 23 Sep 1992, matorral xerófilo, 1350 m, Allred & Valdés-Reyna 5824 (NMC). **Juárez:** 5 km Norte de Samalayuca, 24 Oct 74, Zona de medianos-dunas [dune area], 1730 m, Valdés-Reyna VR-776 (RELC).

*Aristida pansa* Wooton & Standl. fo. *pansa*

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Aldama, 24 Aug 1978, matorral [scrub], 1250 m, Molinar, Baray 26c (MEXU); 10.9 (rd) mi NE of Aldama along Hwy 16, 14 Sep 1972, matorral, 4200 ft, J. Henrickson 7500 (MEXU). **Ahumada:** ca 23 (air) mi ENE of Villa Ahumada in NW canyon of Sierra de la Alcaparra NE of Rancho El Palmar, 12 Sep 1973, matorral, 3800 ft, J. Henrickson 12882 (MEXU).

**Camargo:** E Chihuahua, 4 mi SE of Mesteñas, road from Jaco, to Mesteñas (vía Honorato, Victoria and San Francisco), 5 Oct 1941, 1380 m, *R. Stewart & I.M. Johnson* 2016 (US); 7 mi S of Camargo, 22 Oct 1957, matorral xerófilo [xerophilous scrub], 1300 m, *Gould* 7946 (NMC). **Chihuahua:** La Campana Experimental Station and Rancho El Arco Iris, about 81–84 km along the Pan American hwy, Sep 1977, 1500 m, *J.K. Meents & W.H. Moir* 7 (ENCB); Arenal del 45, 12 km E of La Campana, 28 Sep 1973, 1400 m, *Valdés-Reyna* VR-368 (ENCB); km 14 N of Cd. Chihuahua, 15 Sep 1955, *Hern.-Xol* N-1752, N-1755 (ENCB, US); 6 km ESE of Rancho Chupaderos in the W part of the Sierritas del Rosario, 29 Aug 1972, matorral, 1575 m, *F. Chiang, T. Wendt & M.C. Johnston* 8987 (MEXU). **Jiménez:** 13 km al S of Jiménez, 30 Jul 1939, 1460 m, *L. H. Harvey* 1344 (ENCB). **Juárez:** 5 km al N de Samalayuca, Ciudad Juárez, 24 Oct 1974, 1270 m, *Valdés-Reyna* VR-776 (ENCB). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, *Quintana, Lebgue & Estrada* 3764 (NMC).

29. *Aristida purpurea* Nutt., Trans. Amer. Philos. Soc., n.s., 5: 145. 1837.

Perennial; densely caespitose, without rhizomes. Culms 10–100 cm long, erect to ascending, usually unbranched. Leaves mostly basal or mostly cauline; sheaths shorter or longer than the internodes, glabrous, not disintegrating into threadlike fibers

at maturity; collars glabrous, or sparsely pilose at the sides with straight hairs; ligules less than 0.5 mm long; blades 4–25 cm long, 1–1.5 mm wide, tightly involute to flat, usually glabrous, sometimes scaberulous abaxially, gray-green, lax to curled at maturity. Inflorescences usually sparingly branched panicles, occasionally racemes, 3–30 cm long, 2–12 cm wide, with 2 or more spikelets per node; nodes glabrous or with straight, about 0.5 mm, hairs; primary branches 3–6 cm long, appressed to divaricate, varying sometimes within a panicle, stiff to flexible, bases appressed or abruptly spreading, usually without axillary pulvini. Spikelets divergent or appressed, with or without axillary pulvini. Glumes usually unequal, sometimes subequal, light to dark brown or purplish, glabrous, smooth or scaberulous, 1(2)-veined, acuminate, unawned or awned, awns to 1 mm; lower glumes 4–12 mm; upper glumes 7–25 mm; calluses 0.5–1.8 mm; lemmas 6–16 mm long, glabrous, scaberulous, or tuberculate, whitish to purplish, apex 0.1–0.8 mm wide, not beaked or the beak less than 3 mm long, junction with the awns not conspicuous; awns (8)13–140 mm long, ascending to divaricate, not disarticulating at maturity; central awns thicker than the lateral awns; lateral awns (8)13–140 mm long, usually subequal to the central awns, occasionally less than 1/3 as long as the central awns; anthers 3, 0.7–2 mm long. Caryopsis 6–14 mm long.  $2n = 22, 44, 66, 88$ .

*Aristida purpurea* is composed of several intergrading varieties.

#### KEY TO VARIETIES OF *ARISTIDA PURPUREA*

1. Lower or all primary panicle branches stiff, divergent to divaricate from the base, with axillary pulvini; awns 1.3–3 cm long ..... *A. purpurea* var. *perplexa*
1. Primary panicle branches appressed or ascending at the base, sometimes drooping distally, without axillary pulvini; awns 0.8–14.0 cm long.
  2. Awns 3.5–10 cm long.
    3. Lemmas apex 0.1–0.3 mm wide; awns 3.5–6 cm long, 0.1–0.2(0.3) mm wide at the base; upper glumes usually less than 1.6 cm long ..... *A. purpurea* var. *purpurea*
    3. Lemma apex 0.3–0.8 mm wide; awns 4–10 cm long, 0.2–0.5 mm wide at the base; upper glumes 1.4–2.5 cm long ..... *A. purpurea* var. *longiseta*
  2. Awns 0.8–3.5 cm long.
    4. Summit of lemma mostly less than 0.2 mm wide, often with a prominent narrowed beak; awns delicate, mostly less than 0.2 mm wide at the base.
      5. Panicle branches and pedicels erect, stiff, occasionally spreading ..... *A. purpurea* var. *nealleyi*
      5. Panicle branches and pedicels drooping to flexuous in an S or U shape ..... *A. purpurea* var. *purpurea*
    4. Summit of lemma mostly wider than 0.2 mm long, usually without a beak or the beak indefinite; awns stout, mostly 0.2 mm or more wide at the base.
      6. Mature panicle branches and pedicels flexible, lax or drooping distally ..... *A. purpurea* var. *purpurea*
      6. Mature panicle branches and pedicels usually stiff, straight.
        7. Panicles usually 3–15 cm long; blades 4–10 cm long, generally basal ..... *A. purpurea* var. *fendleriana*
        7. Panicles usually 15–30 cm long; blades 10–25 cm long, generally cauline ..... *A. purpurea* var. *wrightii*

*Aristida purpurea* var. *fendleriana* (Steud.) Vasey, Rep. U.S. Natl. Herb. 3(1): 46. 1892.

FIGURE 23

Cited from United States and Mexico: Baja California, Chihuahua, Coahuila, Nuevo León, and San Luis Potosí. Samples not seen during the present revision.

*Aristida purpurea* var. *longiseta* (Steud.) Vasey, Rep. U.S. Geogr. Surv., Wheeler 6: 286. 1878.

FIGURE 24

Cited from Canada, United States, and north Mexico. SPECIMENS EXAMINED. MEXICO. Chihuahua. **Ahumada:** 10 km al W de Sueco, carr. [hwy]

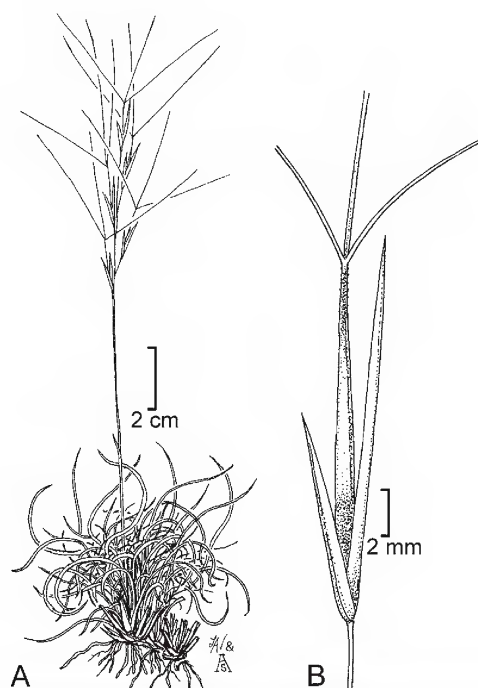


FIGURE 23. *Aristida purpurea* var. *fendleriana*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

Sueco–Buenaventura, 14 Jun 1974, 1300 m, *Valdés-Reyna & C. Hernández* VR-538 (ENCB); 10 km al SE de Moctezuma, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5361 (UACJ). **Ascensión:** Por la carr. a Palomas, justo al N del entronque con [just north of junction with] la carr. a casas Grandes, 11 Jun 2005, 1183 m, *R. Corral, M. Vargas & H. Gutiérrez* RCD7138 (UACJ). **Chihuahua:** Plains near Chihuahua, 8 Oct 1885, *C.G. Pringle* 473 (MEXU, US); La Campana, Potrero La Sierra, 1 km Ote. [W] Carr. Panamericana, 10 Sep 73, pastizal [pastureland], 1570 m, *Valdés-Reyna* VR-157 (RELC). Encinillas, 15 Feb 78, pastizal, *A. Melgoza* 415 (RELC). El Plan, Rancho Experimental La Campana, 19 Abr [Apr] 83, pastizal, *G. Melgoza* 76 (RELC).

*Aristida purpurea* var. *nealleyi* (Vasey) Allred, Brittonia 36(4): 391. 1984. *Aristida stricta* var. *nealleyi* Vasey, Contr. U.S. Natl. Herb. 1(2): 55. 1890.

*Aristida glauca* (Nees) Walp.

FIGURE 25

Cited from Unites States to Mexico.

SPECIMENS EXAMINED. MEXICO. Chihuahua.

Camargo: In arroyo 50 km N of Jiménez, 1 Aug 1939, 1270 m,

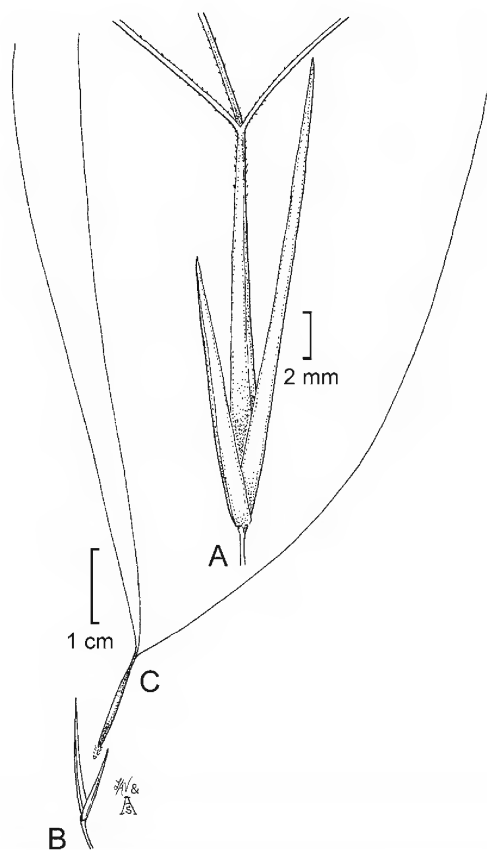


FIGURE 24. *Aristida purpurea* var. *longiseta*. A. Spikelet. B. Glumes. C. Lemma. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

*L. H. Harvey* 1372 (US); 10 km N of Cd. Camargo, 7 Aug 1939, *L. H. Harvey* 1418 (US). **Chihuahua.** Chihuahua, 20 Aug 1935, *LeSueur* Mex-09 (US); Rancho Experimental La Campana, 82 kms al N de Chihuahua, 26 Aug 1978, 1500 m, *C.A. Fernández s.n.* (ENCB); 16.7 mi W of hwy 45 on road up Los Prietos Canyon, 18 Oct 1992, 2120 m, bosque de pino [pine forest], 2120 m, *P.M. Peterson & Annable* 12597 (US); La Campana; 1 km carr. [hwy] Panamericana, 5 Sep 1973, 1570 m, *Valdés-Reyna s.n.* (ENCB). **Jiménez:** 39 mi N of Ceballos on Mex 49, 31 Mar 1971, 3950 ft, *W.E. Harmon, Cox & Dunn* 5433 (ENCB); 50 km al S de Jiménez, 15 Aug 2010, 1442 m, *D. Ramírez & M.L. Juárez* 3414 (CIIDIR); 13 km al S of Jiménez, 30 Jul 1939, 1460 m, *L. H. Harvey* 1345 (US); Sta Eulalia Mts, 8 Sep 1885, *C.G. Pringle* 389 (US); Sierra de Sta Eulalia, 2 km N of San Antonio, 16 Aug 1939, *L. H. Harvey* 1514 (US). **Juárez:** 116 mi N of Gallego, Chih., 18 Jul 1975, 4100 ft, *Wallace, LeDux & Dunn* 115 (ENCB). **Meoqui:** Meoqui, 6 Aug 1936, *LeSueur* 0120 (US).

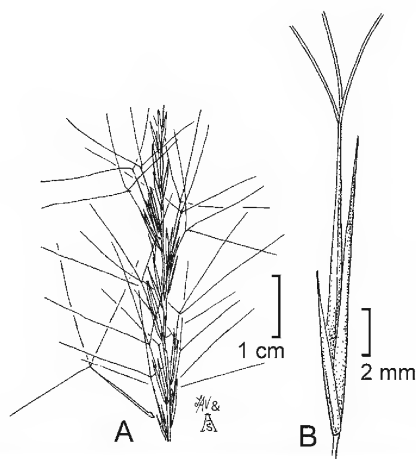


FIGURE 25. *Aristida purpurea* var. *nealleyi*. A. Inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

*Aristida purpurea* var. *perplexa* Allred & Valdés-Reyna, Novon 5(3): 217–221, f. 6. 1995.

FIGURE 26

Cited from Unites States to Mexico in Chihuahua, Coahuila, and San Luis Potosí (Espejo Serna et al., 2000). Samples not seen during the present revision.

*Aristida purpurea* Nutt. var. *purpurea*.

*Aristida roemeriana* Scheele.

FIGURE 27

Cited from Unites States to Mexico and Caribbean Islands.  
SPECIMENS EXAMINED. MEXICO. Chihuahua. **Al-dama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, *P.M. Peterson & Annable* 5756, 5757 (ENCB, US). **Ascensión:** Por la carr. a [by the highway to] Palomas, justo al N del entronque con [just north of the junction with] la carr. a Casas Grandes, 11 Jun 2005, 1183 m, *R. Corral, M. Vargas & H. Gutiérrez* RCD7131 (UACJ). **Balleza:** 24.9 km SE of Balleza and 22.5 km N of hwy 24, W of Parral, 26 Sep 1988, grassland, 1900 m, *P.M. Peterson & Annable* 5954 (ENCB, US). **Chihuahua:** Chihuahua, 3 Sep 1935, *LeSueur* Mex-019 (US). **Coyame:** 13.5 km N of Ojinaga-Chihuahua Hwy, on road to Acebuche, Murciél and Socorro, 11 Jun 1973, 1050 m, *M.C. Johnston, T. Wendt & F. Chiang* 11274 (MEXU). **Guachochi:** Just N of Guachochi (1 km), 26 Sep 1988, pine forest, 2500 m, *P.M. Peterson & Annable* 5916 (ENCB, US). **Hidalgo del parral:** 14 mi E of Parral, 6 Sep 1967, *Reeder & C. Reeder* 4878, 4892 (ARIZ). **Jiménez:** Reserva de la Biosfera de Mapimí, dunas de arena [sand dunes] La Soledad, 9 Jul 1997,

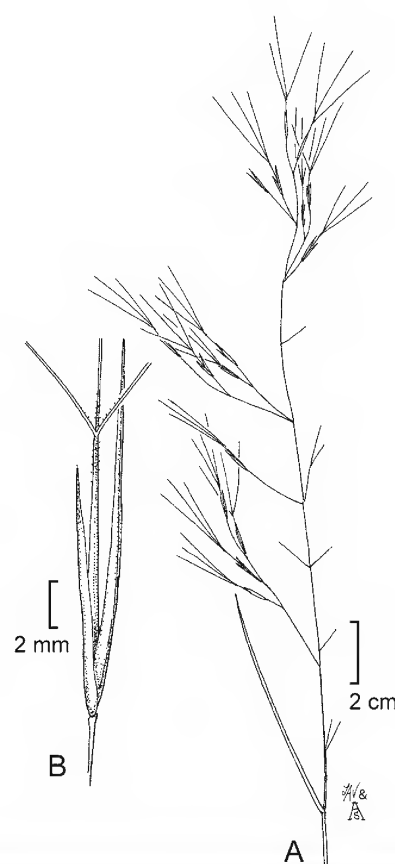


FIGURE 26. *Aristida purpurea* var. *perplexa*. A. Inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

matorral xerófilo [xerophilous scrub], 1140 m, *A. García* 2696 (CIIDIR); Reserva de la Biosfera, presón La Soledad, 3 Sep 1997, matorral xerófilo, 1100 m, *A. García* 2819 (CIIDIR). **Julimes:** S slope and top of Sierra del Roque, NNE of Julimes, approach from Mina Las Playas via Rancho El Saucito, 19 Jun 1973, matorral, 1500–2000 m, *M.C. Johnston, T. Wendt & F. Chiang* 11382 (MEXU). **Matamoros:** 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 1900 m, *P.M. Peterson, Annable & Valdés-Reyna* 10873 (US). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, *P.M. Peterson & Annable* 8100 (ENCB, US).

*Aristida purpurea* var. *wrightii* (Nash) Allred, Brittonia 36(4): 393. 1984. *Aristida wrightii* Nash, Fl. S.E. U.S. 116, 1327. 1903.

FIGURE 28

Cited from Unites States to Mexico (Espejo Serna et al., 2000).



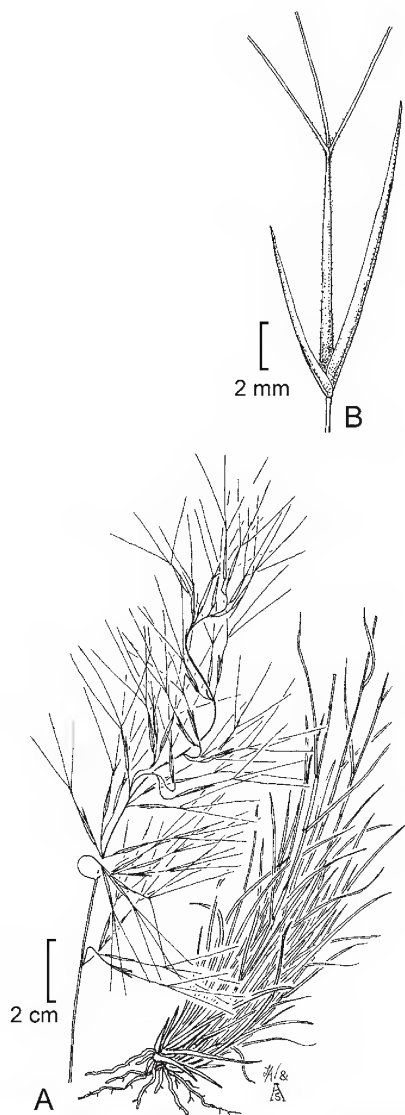


FIGURE 27. *Aristida purpurea* var. *purpurea*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** ca 23 (air) mi ENE of Villa Ahumada in NW canyon of Sierra de la Alcaparra NE of Rancho El Palmar, 12 Sep 1973, matorral [scrub], 1250 m, *J. Henrickson* 12824 (MEXU). **Aldama:** 0.4 mi below (W of) Mina Cerro Verde along Arroyo La Cristina, on road to Chorreras (9.1 mi); N of W part of Ejido Chorreras, 22 Mar 1975, 1160 m, *T. Wendt, E. & J. Lott* 747 (ENCB, MEXU); Cañón Pedregoso, SW peak of range, ca. 6 air mi. ESE of Ejido Chorreras, 21 Mar 1975, canyon dry scrub,

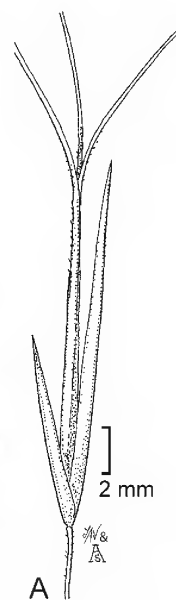


FIGURE 28. *Aristida purpurea* var. *wrightii*. A. Spikelet. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

1500 m, *T. Wendt & E. J. Lott* 715 (MEXU); 19 km N of Aldama, on the road to Coyame, 9 Jul 1972, 1300 m, *F. Chiang, T. Wendt & M.C. Johnston* 8361 (MEXU). **Ascensión:** A few km S of Rancho El Norteño and due E of the S end of Sierra de Moscos, 18 Aug 1972, 1250 m, *F. Chiang, T. Wendt & M.C. Johnston* 8694A (MEXU). **Bocoyna:** Moist llano [flat] SW of Creel near San Ignacio, 17 Oct 1977, on dry slope marginal to the llano, *Bye & W.A. Weber* 8278 (MEXU). **Coyame:** Base (E) of N and of Sierra del Cuchillo Parado where crossed by Ojinaga-Cd. Chihuahua highway 60 km W of Ojinaga, 21 Oct 1972, matorral, 925 m, *F. Chiang, T. Wendt & M.C. Johnston* 9770 (MEXU); 10 km NE of Coyame on the Ojinaga highway, 22 Oct 1972, matorral, 1050 m, *T. Wendt, F. Chiang & M.C. Johnston* 9818 (MEXU). **Guadalupe:** Sierra San Martín de Borracho, approached from the abandoned Rancho Carrizozo on the N side, 15 Jun 1973, Izotal, 1500–2195 m, *M.C. Johnston, T. Wendt & F. Chiang* 11341-A (MEXU). **Ojinaga:** 15 mi S of Ojinaga, on road towards La Perla, Cd. Camargo, 17 Sep 1971, matorral, 4100 ft, *J. Henrickson* 6818 (MEXU).

30. *Aristida schiedeana* Trin. & Rupr., Sp. Gram. Stipac. 120–121. 1842.

Perennial; caespitose. Culms 30–120 cm tall, erect, unbranched. Leaves basal and cauline, pale green, sometimes glaucous; sheaths longer or shorter than the internodes, glabrous except at the summit; collars densely to sparsely pilose or glabrous; ligules less than 0.5 mm long; blades 8–30 cm long, 1–2 mm wide, usually flat, often curled at maturity. Inflorescences paniculate, 10–30 cm long, (4)8–26 cm wide; rachis nodes with straight hairs, hairs to 0.8 mm long; primary branches 6–16 cm long, abruptly spreading to divaricate, stiff to lax, with axillary



pulvini, usually not spikelet-bearing below midlength. Spikelets appressed, rarely spreading. Glumes 1(3)-veined, brown or purple at maturity, acuminate; lower glumes 6–13 mm; upper glumes equaling or to 4 mm shorter than the lower glumes; calluses 0.8–1.2 mm long; lemmas 10–15(17) mm long, terminating in a strongly twisted, 2–4 mm awn-like beak, junction with the awns not conspicuous; awns not disarticulating at maturity; central awns 5–12 mm long, markedly bent near the base; lateral awns absent or to 1(3) mm long, erect; anthers 1.2–2.2 mm long, brownish. Caryopsis 6–8 mm long.  $2n = 22, 44$ .

**DISTRIBUTION AND HABITAT.** *Aristida schiedeana* grows on rocky slopes and plains, generally in pinyon-juniper, oak, or ponderosa pine communities. It has two recognized varieties in Mexico; only the *A. schiedeana* var. *orcuttiana* is found in Chihuahua.

*Aristida schiedeana* var. *orcuttiana* (Vasey) Allred & Valdés-Reyna, *Novon* 5(3): 217. 1995.

FIGURE 29

Cited from the southwestern United States and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 43.5 km W of Balleza and 51.6 km E of Guachochi, 18 Sep 1991, 2320 m, P.M. Peterson, Annable & Valdés-Reyna 10754, 10757 (CIIDIR, US). **Batopilas:** between La Bufa and Quirirem on N side of Barranca de Batopilas, 10 Oct 1973, oak forest, 4500 ft, Bye 5373 (MEXU); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino [pine forest], P.M. Peterson & P. Catalán 17547 (US). **Bocoyna:** Cabecera de la cañada de Recogoata, 22 Sep 1997, bosque de pino-encino [pine-oak forest], 2400 m, B. Tab V. 31 (MEXU); Sánchez, 12 Oct 1910, Hitchcock 7671 (US). **Chihuahua:** 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2110 m, P.M. Peterson & Annable 12553 (US); La Campana, Potrero La Sierra, 4 km W carr. [hwy] Panamericana, 5 Sep 1973, 1700 m, Valdés-Reyna VR-89, VR-148 (ENCB); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 19 Oct 1974, 1700 m, Rzedowski 32332 (ENCB); near Chihuahua, 24 Aug 1885, C.G. Pringle 486 (US); Mts NW of Chihuahua, 30 Jul 1936, LeSueur 0145 (US); La Campana: Potrero La Sierra; 4 km Pte. carr. Panamericana, 5 Sep 1973, pastizal amacollado con encino [grass pasture with oaks], 1700 m, Valdés-Reyna VR-89 (RELC). **Guachochi:** West of Munérachi, 7 Sep 2003, bosque tropical [tropical forest], 1200 m, P.M. Peterson & P. Catalán 17714 (US); 1–2 km south of Rio Osichi and Rio Basihuare jct, 1 Sep 2003, oak forest, 1600 m, P.M. Peterson & P. Catalán 17645 (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, oak forest, 1930 m, P.M. Peterson, Annable & Y. Herrera 8027 (ENCB, US); Parque Nacional Barranca del Cobre, 3.8 km NE of La Bufa and 9.6 km S of Kirare, 1240 m, P.M. Peterson, Annable & Valdés-Reyna 10832 (US); Cusarare, S of Creel, 14 Sep 1973, pastizal [pastureland], Bye 5042 (MEXU); 2 km W

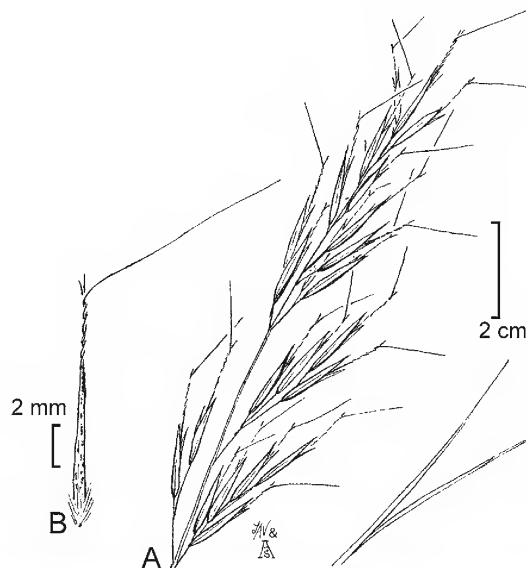


FIGURE 29. *Aristida schiedeana* var. *orcuttiana*. A. Inflorescence. B. Lemma. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

of Rio Corareáchi and E of Osichi, 30 Aug 2003, bosque de pino, 1960 m, P.M. Peterson & P. Catalán 17622 (US). **Guerero:** Miñaca, 13 Oct 1910, Hitchcock 7763 (US); km 19 carr. la Junta San Juanito, 22 Sep 1997, 2300 m, B. Tab V. 24 (MEXU); km 193 carr. Chihuahua–Hermosillo, 24 Sep 1997, 2200 m, M.A. Vergara 170 (MEXU); km 202 carr. Chihuahua–Madera, 8 Aug 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], R. Fierros 1483 (MEXU); 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, P.M. Peterson, Annable & Y. Herrera 7989 (ENCB, US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, P.M. Peterson & R.M. King 8206 (US); Camino Guachochic–Creel, 5 km antes del entronque [before the junction] a la Bufa, 24 Sep 1981, Bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 2700 m, M.E. Siqueiros 1623 (MEXU). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 30 Aug 1939, grassland, 1460 m, L. H. Harvey 1638 (ENCB, US). **Jiménez:** Sta Eulalia Mts, 10 Sep 1885, C.G. Pringle 386 (ENCB); Sta. Eulalia Mts, 10 Sep 1885, 1280 m, E. Wilkinson 4, 343 (US). **Juárez:** On rocky north-facing mountain slope, Sierra Mula, just W of Juarez, 24 Oct 1959, Correll 23306-A (ENCB, US). **Madera:** Mesa del Yerbanís, ejido El Largo, 12 Oct 1990, bosque de *Quercus*, 1900 m, O. Bravo 1828a (CIIDIR); km 202, carr. Chihuahua–Madera, 21 Aug 1981, bosque esclero-aciculifolio, M.E. Siqueiros 1483 (MEXU). **Matachi:** SW of Matachi; on slope on NW side of ridge near km 9.7 on Matachi–Cocomorachi road, 29 Aug 1978, pine-oak forest, 1900 m, Bye

9010, 9007 (MEXU). **Ocampo:** Parque Nacional "Cascada de Basaseachic," near top of falls, 22 Sep 1994, 2000 m, *Spellenberg, Corral & Estrada 12080* (NMC); Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8648* (NMC); Parque Nacional "Cascada de Basaseachic," on ridge top SE side of canyon of Rio Candamena leading to falls, 4 Oct 1986, 1800 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8719* (NMC). **Riva Palacio:** Arroyo del Nido, Sierra del Nido, 3.6 mi by dirt road, southwest of Rancho El Nido, 8 Oct 1982, pine-oak woodland, 1700 m, *F.W. Reichenbacher 1315* (ARIZ); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7972* (ENCB, US). **San Francisco del Oro:** Ejido Corral de Duarte, 21 Sep 1981, bosque esclero-aciculifolio, *E. Blanco 1557* (MEXU).

31. *Aristida spanospicula* Allred, Valdés-Reyna & Sánchez-Ken, *Novon* 5: 209–222. 1995.

Perennial; mat-forming. Culms 25–50(66) cm tall, ascending, slender, not branched above the base, glabrous. Sheaths glabrous or sparsely pilose, ligula 0.5 mm long, a ring of hairs; blades 14–25 cm long, 1.5–2 mm wide, flat to plicate, inrolled when mature, glabrous to puberulent, green pale, the margins hardened. Panicles 10–22 cm long, 1–2 cm wide, with spaced spikelets, 3–12 in total, 2(4) on each branch, widely spaced, with capillary pedicels. Glumes 9–15 mm long, subequal, brown, 1-veined, glabrous; lemma 18–22(25) mm long, convolutes, glabrous, awns 1–3, the central 10–20 mm long, the laterals when present no longer than 0.5 mm; callus 0.6–0.8 mm long, obtuse; stamens 1.7–2 mm long, brown.

**DISTRIBUTION AND HABITAT.** *Aristida spanospicula* grows in pine-oak forests and occurs in Mexico in Chihuahua, Durango, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Urique crossing, towards Basihuare and Creel, 6 Sep 2008, slopes with pines and oaks, 1890 m, *P.M. Peterson & J.M. Saarela 22075* (US); bajada [descent] a Batopilas, 25 Sep 1981, bosque esclero-caducifolio

[deciduous sclerophyllus forest], 2100 m, *R. Fierros 1641* (MEXU). **Bocoyna:** at Cuesta Prieta, along road from San Juanito to Creel, 3.1 mi S of San Juanito, 22 Sep 1992, 2400 m, *K.W. Allred & Valdés-Reyna 5787* (NMC). **Casas Grandes:** W of Casas Grandes, 3 mi W of Cuesta Blanca, 4 Sep 1958, *Reeder & C. Reeder 3214* (ARIZ, US). **Cusihuiriachi:** Rancho El Coronel, 2 Sep 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], 2500 m, *Loya & Méndez 1523* (MEXU). **Guachochi:** Cusarare, south of Creel, 14 Sep 1973, pastizal [pastureland], *Bye 5047* (MEXU); km 85 carr. [hwy] Balleza–Guachochi, 24 Sep 1981, bosque esclerófilo caducifolio, 2300 m, *M.E. Siqueiros 1601* (MEXU). **Guerrero:** Between Cd. Guerrero and Creel, Mar 1974, 2200 m, *A.A. Beetle M-3323* (MEXU). **Madera:** Chuhichupa, Aug–Sep 1936, *LeSueur Mex-0112* (MEXU). **Namiquipa:** Rancho Teseachic, potrero Palmillas [palm pasture], Cerro falda [hillside] del Saucito, 30 Jun 1971, pastizal con encino [pastureland with oak], *P. Pérez 21* (MEXU).

32. *Aristida ternipes* Cav., *Icon.* 5: 46. 1799.

Perennial; caespitose. Culms 25–120 cm tall, wiry, erect to sprawling, unbranched. Leaves basal and cauline; sheaths usually longer than the internodes, glabrous; collars glabrous or strigillose; ligules less than 0.5 mm; blades 5–40 cm long, 1–2.5 mm wide, flat to folded, straight to lax at maturity, adaxial surfaces with scattered 1.5–3 mm hairs near the ligule. Inflorescences paniculate, 15–40 cm long, (8)10–35(45) mm wide; rachis nodes glabrous or strigillose; primary branches 5–25 cm long, remote, stiffly ascending to divaricate, with axillary pulvini, usually naked near the base; secondary branches and pedicels usually appressed. Spikelets usually congested. Glumes subequal, 9–15 mm long, 1-veined, acuminate; calluses 1–1.2 mm; lemmas 9–15 mm long, smooth to tuberculate-scabrous, narrowing to slightly keeled, usually not twisted, 0.1–0.2 mm wide apex, junction with the awns not evident; awns unequal or almost equal, not disarticulating at maturity; central awns 8–25(30) mm long, straight to arcuate at the base; lateral awns absent or to 23 mm; anthers 3, 1.2–2.4 mm. Caryopsis 6–8 mm long, light brownish.  $2n = 22, 24$ .

Two varieties from this species are recognized in Mexico, both in Chihuahua.

#### KEY TO VARIETIES OF *ARISTIDA TERNIPES*

- 1. Lateral awns 2–23 mm long ..... *A. ternipes* var. *gentilis*
- 1. Lateral awns 0–2 mm long ..... *A. ternipes* var. *ternipes*

*Aristida ternipes* var. *gentilis* (Henrard) Allred, *Phytologia* 77: 412. 1995. *Aristida gentilis* Henrard, *Meded. Rijks-Herb.* 54:196. 1926.

*A. hamulosa* Henrard, *A. ternipes* var. *hamulosa* (Henrard) Trent.

FIGURE 30

**DISTRIBUTION AND HABITAT.** *Aristida ternipes* var. *gentilis* grows in grasslands and desert scrub and ranges from the United States to Mexico, Guatemala, and Honduras.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** Gallegos, 2 Oct 1958, *G. Neville J. 22485* (MEXU). **Aldama:** 19 km N of Aldama, on the road to Coyame, 9 Jul 1972, 1300 m, *F.Chiang, T. Wendt & M.C. Johnston 8360* (MEXU); 13.3 (rd) mi NE of Aldama along Chihuahua Hwy 16, 14 Sep 1972, *Larrea* scrub, 1400 m, *J. Henrickson 7520* (ARIZ). **Alende:** Carr. [hwy] 45 Parral–Torreón, 20 km al N del Poblado [village] Río Florido, Chih., 15 Sep 1970, 1850 m, *E. Estrada 4107* (ENCB). **Batopilas:** Batopilas, 25 Sep 1981, selva baja caducifolia [low deciduous forest], 530 m, *R. Fierros 1662, 1684*

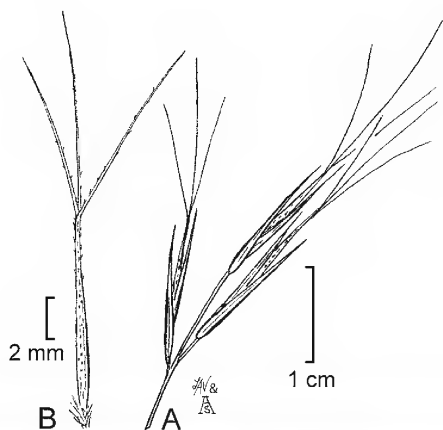


FIGURE 30. *Aristida ternipes* var. *gentilis*. A. Inflorescence branch. B. Lemma. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

(MEXU). **Bocoyna:** Barrancas del Cobre, camino a Río Urique por Estación Divisadero, 16 Aug 1975, bosque bajo de leguminosas [low legume forest], 1875 m, *S. González* 718 (RELC). **Chihuahua:** 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1463 m, *Soderstrom* 895 (US); La Campana Experimental Station and Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, 1500 m, *J.K. Meents & W.H. Moir* 103 (NMC); La Campana; bajío [shallows] 12 km Ote. [W] carr. Panamericana, 13 Sep 1973, pastizal halófito [halophyte pastureland], 1450 m, *Valdés-Reyna* VR-242 (RELC); km 1773 carr. a Cd. Juárez, 15 Sep 55, pradera con encinos dispersos [meadow with scattered oaks], 1500 m, *Hern.-Xol & V. Mathus* N-1838, N-1840 (RELC); La Campana, 1 km Pte. Carr. Panamericana, 31 Aug 1973, pastizal, 1570 m, *Valdés-Reyna* VR-199, VR-34 (RELC); *S. González* 282 (RELC); Chihuahua, 3 Aug 1978, pastizal, 1450 m, *Molinar-Delgadillo* 13 (MEXU); km 52 carr. Chihuahua–Juárez, 3 Aug 1978, pastizal, 1450 m, *I.D. Enriquez* 8 (MEXU); carr. Chihuahua–Cuauhtémoc, 27 Abr [Apr] 1981, pastizal, *E. Blanco* 1242 (MEXU); Sacramento, 21 Jul 1976, pastizal, 1570 m, *Gómez-Blanco* 32 (MEXU); 19 km N of Aldama, on the road to Coyame, 9 Jul 1972, 1300 m, *F.Chiang, T. Wendt & M.C. Johnston* 8360 (MEXU). **Guachochi:** 2 km W of Rio Corareáchi and E of Osichi, 30 Aug 2003, bosque de pino [pine forest], 1960 m, *P.M. Peterson & P. Catalán* 17622A (US); Camino Guachochi–Creel, 5 km del entronque [junction] a la Bufo, 24 Sep 1981, bosque sclero-caducifolio [deciduous sclerophyllus forest], 2700 m, *M.E. Siqueiros* 1635 (MEXU). **Hidalgo del Parral:** 14 mi E of Parral, 6 Sep 1967, 5300 ft, *Reeder & C. Reeder* 4880 (ARIZ, ENCB, US). **Janos:** near San Pedro River, Mexican boundary line, 18 Jun 1892, *E.A. Mearns* 355 (US); km 5 carr. Janos–Agua Prieta, 13 Jun 1981, matorral [scrub], 1830 m, *I. Enriquez & Jaramillo* 1321 (MEXU). **Jiménez:** LBJ's Rancho Las Pampas, ca. 13 km SE of the min ranch house (Acebuches), 27 Aug 1972,

pastizal, 1450 m, *M.C. Johnston, T. Wendt & F.Chiang* 8950 (MEXU). **La Cruz:** La Paz microwave relay station, 26 km W of Camargo, 8 Jul 1972, top of basalt-capped hill overlooking Río Conchos, 1400 m, *F.Chiang, T. Wendt & M.C. Johnston* 8329? (MEXU). **Madera:** Laguna de Babicora, alrededores [surroundings] de Nicolas Bravo, 18 Aug 1994, 2200 m, *Quintana, Lebgue & Estrada* 3133 (NMC). **Manuel Benavides:** Entre [between] Manuel Benavides & Pocitos, 2 Aug 1975, Ladera de cerro con pastizal [hillside with pasture], 1342 m, *S. González* 455 (RELC); 69 (rd) mi S of Ojinaga along Hwy 18 (Ojinaga–C. Camargo), 17 Sep 1972, pastizal, 1500 m, *J. Henrickson* 7717 (MEXU); 7½ mi S Piramide, 11 Aug 1941, *I.M. Johnston* 8108 (MEXU).

#### *Aristida ternipes* var. *ternipes*

FIGURE 31

**DISTRIBUTION AND HABITAT.** *Aristida ternipes* var. *ternipes* grows in grasslands, desert scrub, and oak forests. It ranges from the United States to Mexico, South America, and the Caribbean Islands.

**SPECIMENS EXAMINED.** **MEXICO.** Chihuahua. **Aldama:** 13.3 (rd) mi NE of Aldama along Chihuahua Hwy 16, 14 Sep 1972, 1400 m, *J. Henrickson* 7520 (NMC). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 115, 161 (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela* 22153, 22154 (US). **Chihuahua:** La Campana Experimental Station and Rancho El Arco Iris, about 81–84 km along the Pan American hwy to Chihuahua City, Sep 1977, 1500 m, *J.K. Meents & W.H.*

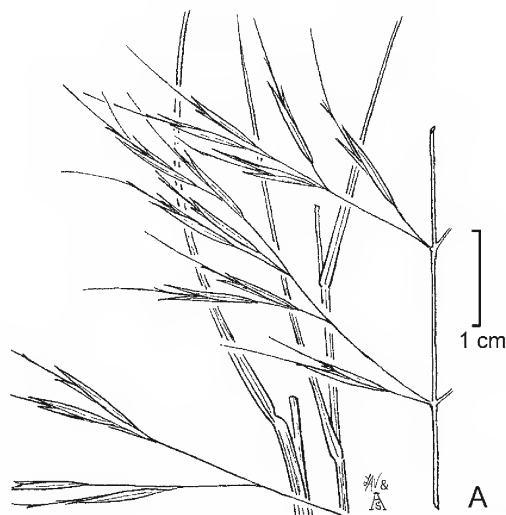


FIGURE 31. *Aristida ternipes* var. *ternipes*. A. Habit. Drawn by Linda Ann Vorobik and Andy Sudkamp; copyright Utah State University.

Moir 78 (ENCB); Rocky hills near Chihuahua, 13 Aug 1885, C.G. Pringle 387-B (US); 25 km W of Chihuahua, 20 Aug 1939, pastizal [pastureland], 1635 m, L. H. Harvey 1544 (US). **Gua-chochi:** 7.4 km SW of La Bufa and 15 km NE of Batopilas, 920 m, thorn scrub vegetation, 20 Sep 1991, P.M. Peterson, Annable & Valdés-Reyna 10850 (US). **Janos:** Chihuahua-Sonora border, Rancho Carretas, 27 Aug 1939, bosque de encino [oak forest], 1780 m, L. H. Harvey 1633 (US); La Campana Experimental Station and Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, J.K. Meents & W.H. Moir 71, 74 (NMC). **Jiménez:** Sierra de Sta Eulalia, 2 km N of San Antonio, 16 Aug 1939, L. H. Harvey 1498 (US); 8 mi N of Jiménez on Mex. 45, 30 Aug 1971, 4400 ft, L. H. Harvey 8894 (ENCB). **Madera:** Paraje Sirupa, ejido Cebadilla de Dolores, 24 Aug 1990, matorral de *Juniperus* [juniper scrub], 1220 m, A. Benítez 1931 (CIIDIR). **Meoqui:** Meoqui, 24 Aug 1935, LeSueur Mex-038 (US). **Satevo:** Parral-Chihuahua road, 19 km N of Rio San Pedro, 8 Aug 1939, matorral xerófilo [xerophilic scrub], 1375 m, L. H. Harvey 1426 (US). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, P.M. Peterson & Annable 8099 (ENCB, US).

### ***Arundo* L.**

Perennial; rhizomatous, rhizomes short, usually more than 1 cm thick. Culms 2–10 m tall, 1–3.5 cm thick, usually erect, occasionally pendant from cliffs; nodes glabrous; internodes hollow. Leaves cauline, conspicuously distichous, glabrous; sheaths open, longer than the internodes; ligules membranous, shortly ciliate; blades flat or folded, margins scabrous. Panicles terminal, plumose, silvery to purplish. Spikelets laterally compressed, with 1 to several florets; rachilla internodes glabrous; disarticulation above the glumes and between the florets. Glumes longer than the florets, 3- to 5-veined; lemmas pilose, hairs not papillose-based, 3- to 7-veined, apex entire or minutely awned; paleas shorter than the lemmas, 2-veined; anthers 3.  $x = 12$ .

*Arundo*, a genus of three species, grows throughout the tropical and warm-temperate regions of the world. Only one species has been introduced to the Western Hemisphere.

#### 33. *Arundo donax*\* L., Sp. Pl. 1: 81. 1753.

FIGURE 32

Culms (2)3–10 m tall, in large tussocks or hedges. Leaves distichous; ligules 0.4–1 mm long; blades 30–100 cm long, 2–7(9) cm wide, cordate to clasping below, light to dark brown area at the base. Panicles 30–60 cm long, to 30 cm wide. Spikelets 10–15 mm long, with 2–4 florets. Glumes subequal, as long as the spikelets, thin, brownish or purplish, 3-veined, long-acuminate; lemmas 8–12 mm long, 3- to 5-veined, pilose, hairs 4–9 mm long, apex bifid, midvein ending into a delicate awn; paleas 3–5 mm long, pilose at the base; anthers 2–3 mm long. Caryopsis 3–4 mm long, oblong, light brown.  $2n = 24$ , 100, 110.

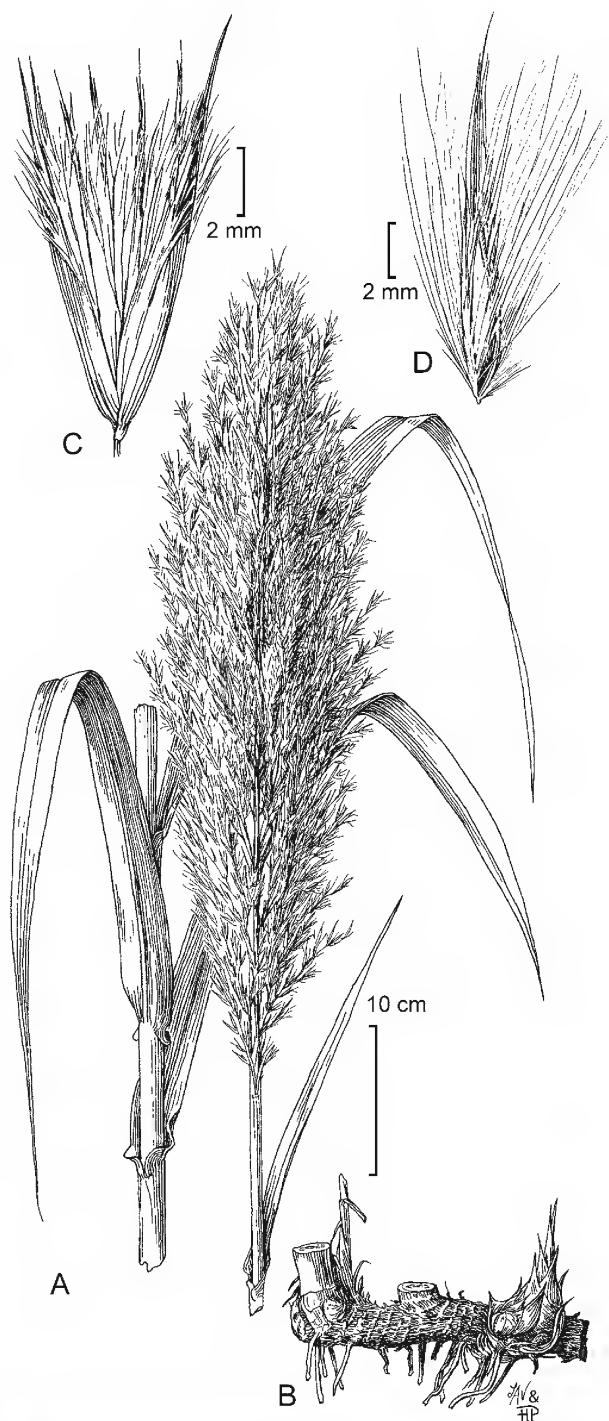


FIGURE 32. *Arundo donax*. A. Culm and inflorescence. B. Rhizome. C. Spikelet. D. Floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Arundo donax* grows in the southern half of the contiguous United States and throughout Mexico, being found along ditches, culverts, and roadsides where water accumulates. It is grown for its ornamental value of tall, leafy culms and large panicles.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** 14.5 km N of Batopilas on road to La Bufa, 12 Sep 1989, 850 m, P.M. Peterson, Annable & Y. Herrera 8062 (ENCB, US); Barranca de Batopilas, vicinity of La Bufa, Nov 1973, Bye 3949, 9614 (MEXU); 20 km de Batopilas, pequeña cañada a orilla de la carr. sobre la barranca [small glen to side of road on the canyon] del Río Batopilas, 30 Abr [Apr] 1980, F.S. Montañón & M.A. Martínez *sn* (MEXU); SW of Chihuahua, Aug–Nov 1885, E. Palmer 51A (US); Barranca de Batopilas, near Creel–La Bufa road, 9 Jun 1963, margin of riverbed, 850 m, S. Felger & R. Russell 8081 (ARIZ). **Bocoyna:** Barrancas del Cobre, camino a Alto Río Urique por Estación Divisadero, 15 Aug 1976, bosque bajo espinoso [thorny low forest], 1975 m, S. González & J.M. Peña 715 (RELC). **Delicias:** About 14 mi S of Las Delicias, 4 Oct 1953, cultivated valley, 1220 m, Reeder, C. Reeder 2614 (MEXU). **Juárez:** Ciudad Juárez, a lo largo [along] de la “Asequia Madre” entre [between] la Av. Américas & Paseo Triunfo de la República, 29 Sep 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6413 (UACJ); Ciudad Juárez a lo largo de la “Asequia Madre” al N del fracc. Rincones de San Marcos, 13 Oct 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6545 (UACJ); Ciudad Juárez a lo largo [along] de la “Asequia Madre” desde la intersección de las calles [from the intersection of streets] Mejía & Santos Degollado, hasta el túnel bajo [until the tunnel under] el Viaducto Díaz Ordaz, 3 Jun 1995, 1140 m, R. Corral & L.M. Barraza RCD6113 (UACJ). **Madera:** Near Chuhichupa in the Sierra Madres, 3 Sep 1899,

bosque de encino [oak forest], 2240 m, C.H.T. Townsend & C.M. Barben 399 (NMC). **Práxedes G. Guerrero:** aprox. 3 km al NW del Porvenir, por la carr. [hwy] Juárez–Porvenir, a los lados de cultivo de algodón [near cultivated cotton], 8 Sep 1994, 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5413 (UACJ). **Uruachi:** Río Mayo between Moris and San Bernardo. 25 Sep 1991, 500 m, along the banks of the river, P. Jenkins 91-79 (ARIZ).

## Avena L.

Annual or perennial. Culms 8–200 cm tall, erect or decumbent. Sheaths open; auricles absent; ligules membranous; blades usually flat, sometimes involute, lax. Inflorescences as panicles, diffuse, sometimes 1-sided. Spikelets 15–50 mm long, laterally compressed, with 1–6(8) florets; rachillas not prolonged beyond the uppermost floret; disarticulation above the glumes, usually also between the florets, or cultivated forms not disarticulating. Glumes usually exceeding the florets, membranous, glabrous, 3- to 11-veined, acute; calluses rounded to pointed, with or without hairs; lemmas usually indurate and enclosing the caryopsis at maturity, 5- to 9-veined, often with twisted, strigose hairs below midlength, apex dentate to bifid or biaristate, awns (if present) dorsal, usually once-geniculate and strongly twisted in the basal portion; paleas bifid or entire, ciliate on the keels; lodicules 2, free, glabrous, toothed or not toothed; anthers 3; ovaries hairy. Caryopsis terete, ventrally grooved, pubescent.  $x = 7$ .

**DISTRIBUTION AND HABITAT.** *Avena*, a genus of 29 species, is native to temperate and cold regions of Europe, North Africa, and central Asia; it has become nearly cosmopolitan through the cultivation of cereal oats and the inadvertent introduction of the weedy species.

## KEY TO SPECIES OF AVENA

1. Lemma conspicuously pubescent dorsally, the awn geniculate and twisted; spikelets usually with 3 florets; lodicules without lateral lobes or teeth; weeds of cultivated areas . . . . . *A. fatua*
1. Lemma glabrous or sparsely pubescent at the base, the awn straight or weakly twisted and weakly geniculate; spikelets with 2 florets; lodicules with a small terminal tooth or lobe below the center; plants cultivated, rarely persistent . . . . . *A. sativa*

### 34. *Avena fatua*\* L., Sp. Pl. 1: 80. 1753.

FIGURE 33

Annual. Culms 8–160 cm long, prostrate to erect when young, becoming erect at maturity. Sheaths of the basal leaves with scattered hairs, distal sheaths glabrous; ligules 4–6 mm long, acute; blades 10–45 cm long, 3–15 mm wide, scaberrulous. Panicles 7–40 cm long, 5–20 cm wide, nodding. Spikelets 18–32 mm long, with 2(3) florets; disarticulation beneath each floret; disarticulation scars round to ovate or triangular. Glumes subequal, 18–32 mm long, 9- to 11-veined; calluses bearded, hairs to  $\frac{1}{4}$  the length of the lemmas; lemmas 14–22 mm long, usually densely strigose below midlength, varying to sparsely

strigose or glabrous, veins not excurrent beyond the apex, apex usually bifid, teeth 0.3–1.5 mm long, awns 23–42 mm long, arising in the middle  $\frac{1}{3}$  of the lemmas; lodicules without lobes on the wings; anthers about 3 mm long.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Avena fatua* is native to Europe and central Asia. It is known as a weed in most temperate regions of the world; in some parts of Canada and the United States it is considered a noxious weed.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ascensión:** alrededores del cruce del río [near river crossing] Casas Grandes con la carr. [hwy] Juárez–Ascensión, 11 Jun 2005, 1180 m, R. Corral, M. Vargas & H. Gutiérrez RCD7150 (UACJ).



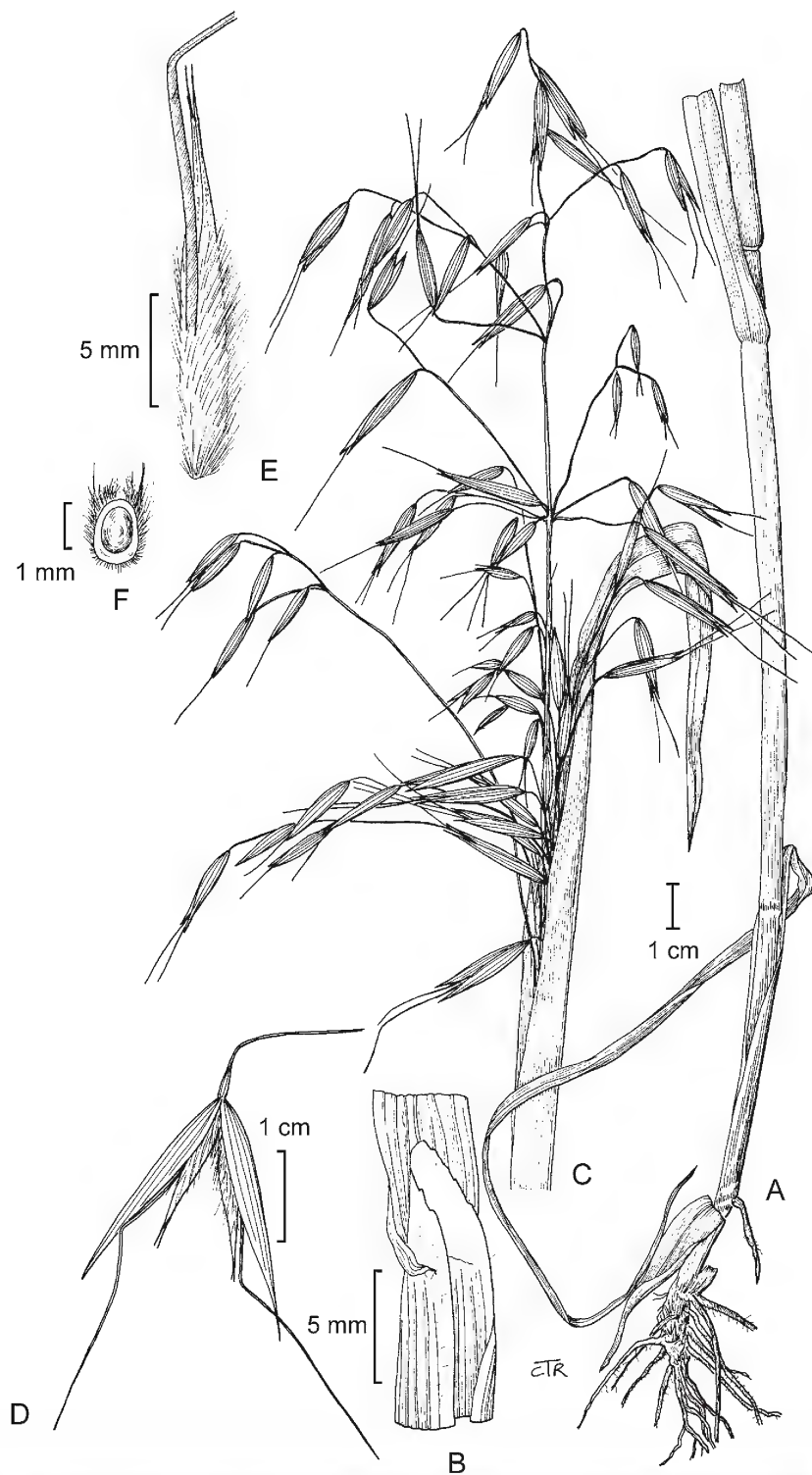


FIGURE 33. *Avena fatua*. A. Habit. B. Ligule. C. Inflorescence. D. Spikelet. E. Floret. F. disarticulation scar. Drawn by Cindy Roché; copyright Utah State University.

35. *Avena sativa*\* L., Sp. Pl. 1: 79. 1753.

FIGURE 34



FIGURE 34. *Avena sativa*. A. Habit. B. Ligule. C. Spikelet. D. Floret. Drawn by Cindy Roché; copyright Utah State University.

Annual. Culms 40–180 cm tall, prostrate to erect when young, becoming erect at maturity. Sheaths smooth or scaberulous; ligules 3–8 mm long, acute; blades 8–45 cm long, 3–14 (25) mm wide, scaberulous. Panicles (6)20–40 cm long, 5–15 cm wide, nodding. Spikelets (18)25–32 mm (to 50 mm in naked oats), with 1–2 florets (to 7 in naked oats); disarticulation not occurring, the florets remaining attached even when mature. Glumes subequal, (18)20–32 mm long, 9- to 11-veined; calluses glabrous; lemmas 14–18 mm long, usually indurate (membranous in naked oats), usually glabrous, sometimes sparsely strigose, apex erose to dentate, longest teeth 0.2–0.5 mm long, awns usually absent, 15–30 mm when present, arising in the middle  $\frac{1}{3}$ , straight or weakly twisted and weakly geniculate; lodicules with a lobe or tooth on the wings, this sometimes very small; anthers (1.7)3–4.3 mm long.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Avena sativa*, a native of Eurasia, is widely cultivated in cool, temperate regions of the world, including North America. Several forms are grown, of which the most distinctive are naked oats. These differ from typical forms as indicated in the description and in having caryopses that fall.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5868 (ENCB, US); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 24 Sep 1988, pine forest, 2200 m, P.M. Peterson & Annable 5874 (ENCB, US). **Chihuahua:** La Campana; Potrero El Plan, 4 km Ote [W], carr. [hwy] Panamericana, 5 Sep 1973, lotes producción de semilla [seed-production lots], 1500 m, Valdés-Reyna VR-92 (RELC). **Matamoros:** 19.3 km S of Villa Matamoros on Hwy 45 to Durango, 3 Oct 1989, grassland, 1910 m, P.M. Peterson & R.M. King 8251 (US). **Práxedes G. Guerrero:** a 2 km del poblado [village] Práxedes G. Guerrero (San Ignacio), Rancho Escuela de la Univ. Autónoma de Ciudad Juárez, 5 May 1995, maleza de acequia [weed of ditch], 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & A. Soutyrine RCD6079 (UACJ); Rancho Escuela, 16 Aug 1997, I. Enriquez, S. Ordoñez, L. Sushii, S. Carrasco, A. Perales & N. Loya IEA8 (UACJ). **Temo-sachi:** Nabogame, 22 Jun 1988, 1800 m, Laferr. 1366 (ARIZ).

### *Avenella* (Bluff & Fingerh.) Drejer

Plants usually perennial, sometimes annual; caespitose or tufted. Culms hollow, erect. Leaves usually mainly basal, often forming a dense tuft; sheaths open; auricles absent; ligules membranous, decurrent, rounded to acuminate; blades often all or almost all tightly rolled or folded and some flat, sometimes most flat, others rolled or folded. Inflorescences terminal panicles, open or contracted; disarticulation above the glumes, beneath the florets. Spikelets with 2(3) florets in all or almost all spikelets, florets usually bisexual, sometimes viviparous; rachillas

hairy, usually prolonged more than 0.5 mm beyond the base of the distal floret, sometimes terminating in a highly reduced floret. Glumes subequal to unequal, usually exceeding the adjacent florets, often exceeding all florets, 1- to 3-veined, acute to acuminate; calluses antrorsely strigose; lemmas obscurely (3)5- to 7-veined, rounded over the back, apex truncate-erose to 2-4-toothed, awned, awns usually attached on the lower ½ of the lemmas, occasionally subapical, straight to strongly geniculate, slightly to strongly twisted proximally, straight distally; paleas shorter than the lemmas, 2-keeled, keels often scabrous; lodicules 2, lanceolate to ovate-lanceolate, usually entire; anthers 3; ovaries glabrous; styles 2. Caryopsis oblong; embryos about ¼ the length of the caryopsis.  $\times = 7$ .

*Avenella*, a segregate of *Deschampsia* includes one species widely distributed in America. It grows in cool, damp habitats throughout the world.

36. *Avenella flexuosa* (L.) Drejer, Fl. Excurs. Hafn. 32. 1838. *Aira flexuosa* L., Sp. Pl. 1: 65. 1753. *Deschampsia flexuosa* (L.) Trin., Mém. Acad. Imp. Sci. Saint-Petersbourg, Sér. 6, Sci. Math., Seconde Pt. Sci. Nat. 1: 66. 1836.

FIGURE 35

Perennial; densely caespitose. Culms 30–80 cm long, erect or geniculate at the base, usually with 2 nodes. Leaves mostly basal, sometimes forming a basal tuft; sheaths smooth, glabrous; ligules 1.5–3.6 mm long, rounded to acute; blades 12–25 cm long, strongly rolled, 0.3–0.5 mm in diameter, abaxial surfaces smooth or scaberulous, glabrous or hairy, often scaberulous or hairy proximally and essentially smooth and glabrous distally, adaxial surfaces scabrous, flag leaf blades 5–8 cm. Panicles 5–15 cm long, (2)4–12 cm wide, narrow to open, often nodding; branches ascending to spreading, flexuous, smooth or scaberulous. Spikelets 4–7 mm long, ovate or U-shaped. Glumes exceeded by or subequal to the adjacent florets, 1-veined, acute; lower glumes 2.7–4.5 mm long; upper glumes 3.5–5 mm long; callus hairs to 1 mm long; lemmas 3.3–5 mm long, scaberulous or puberulent, hairs to 0.1 mm long, apex acute, erose to 4-toothed, awns 3.7–7 mm long, attached near the base of the lemma, strongly geniculate, geniculation below the lemma apex, distal segment 2.5–4.5 mm long, pale; anthers 2–3 mm long.  $2n = 14, 26, 28, 32, 42$ .

**DISTRIBUTION AND HABITAT.** *Avenella flexuosa* grows on dry, often rocky, slopes and in woods and thickets, often in disturbed sites. It is primarily eastern in distribution, with records from west of the Great Lakes and Appalachians probably being introductions. It is also known from Mexico, Central America, South America, Borneo, the Philippines, and New Zealand.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: 38 km W of hwy 45 on road towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2230 m, P.M. Peterson & Annable 12575 (US). Cuauhtémoc: 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9591 (US). Gómez Farías: Laguna de Babicora, 18 Aug 1994,

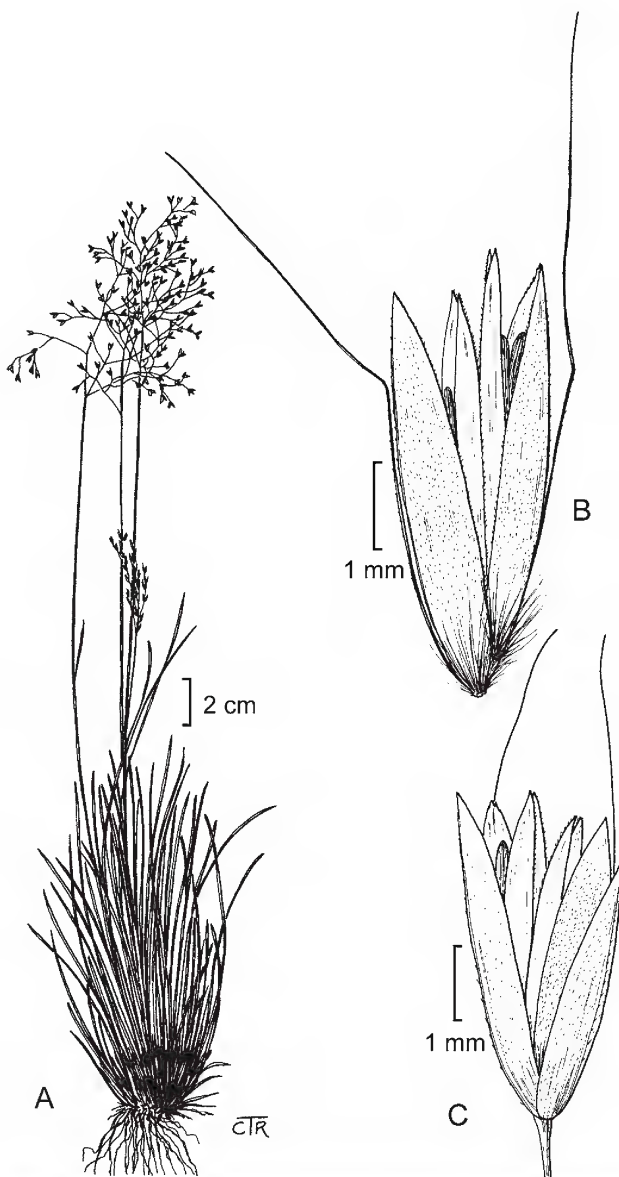


FIGURE 35. *Avenella flexuosa*. A. Habit. B. Spikelet. C. Florets. Drawn by Cindy Roché; copyright Utah State University.

2150 m, T. Lebgue & E. Estrada 3324 (NMC). Guadalupe y Calvo: on summit of Sierra Mohinora, 10,000–10,300 ft, conifer forest, 16–17 Oct 1959, Correl & Gentry 23179 (ENCB, US); near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20039, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). Ocampo: Parque Nacional “Cascada de Basaseachic,” 25 Abr [Apr] 1986, 1700 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8474 (NMC).

### ***Blepharidachne* Hack.**

Perennial, rarely annual; caespitose, from a knotty base, often mat-forming. Culms often decumbent and rooting at the lower nodes, frequently branched above the bases, forming short spur shoots at the ends of long internodes; internodes minutely pubescent. Leaves clustered at the bases of the primary and spur shoots; basal sheaths shorter than the internodes; ligules of hairs or absent; blades linear to triangular, convolute to conduplicate, or flat to plicate, sharp, those of the upper leaves usually exceeding the inflorescences. Inflorescences terminal, compact panicles, exerted or partially included in the upper sheath(s). Spikelets laterally compressed, subsessile or pedicellate, with 4 florets per spikelet; disarticulation above the glumes but not between the florets. Glumes subequal to each other and the lowest lemma, rounded or weakly keeled, 1-veined, awn-tipped or unawned; lowest 2 florets in each spikelet staminate or sterile; third floret pistillate or bisexual; lemmas rounded on the back, 3-veined, mostly glabrous but pilose across the bases and on the margins, strongly 3-lobed, lateral lobes wider than the central lobes, all lobes ciliate on 1 or both margins, lower lemmas slightly shorter to slightly longer than the lemmas; lodicules absent; anthers 2 or 3 (rarely 1); style branches 2. Distal florets rudimentary, 3-awned, plumose, or hairy. Caryopsis laterally compressed.  $x = 7$ .

The four species of *Blepharidachne* are restricted to the Americas, growing in arid and semi-arid regions of the United States, Mexico, and Argentina. One species occurs in our study area.

**37. *Blepharidachne bigelovii* (S. Watson) Hack., Monogr. Phan. 6: 261. 1889.**

Plants caespitose, from a firm, often knotty base. Culms 6–20 cm tall, freely branched at and above the bases. Sheaths usually with a tuft of hairs on either side of the collars, often puberulent on the backs; ligules to 0.3 mm long; blades 1–2 cm long, less than 1 mm wide, involute, convolute to conduplicate, firm, harshly puberulent, stiffly arcuate, lower blades deciduous. Panicles 15–30 mm long, 10–15 mm wide, exerted or partially included in the upper 2, subopposite, subtending sheaths; rachises and branches puberulent. Spikelets 5–7 mm long; glumes nearly equal to the lowest lemmas in the spikelets, exceeded by the distal

florets, thin, translucent, smooth or the vein scaberulous, subacute; lower glumes 5–6 mm long; upper glumes about 6 mm long; lowest florets staminate, 4–5 mm long; second florets sterile, about 5 mm long, lateral lobes 1–3 mm long; paleas of lowest 2 florets reduced, membranous; third florets pistillate, third lemmas 5.5–6 mm long, lateral lobes 3–4.5 mm long, awned, central awns 2.5–3 mm long; paleas of third florets slightly longer than the lemmas; anthers 2(1), 1.2–1.5 mm long. Caryopsis 1.5–2 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Blepharidachne bigelovii* grows on rocky slopes in western Texas and adjacent areas of New Mexico and in Coahuila and Zacatecas, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Juárez: 5 km SW of Cd. Juárez in the extreme N end of Sierra Juárez, 17 Apr 1992, matorral de gobernadora-lechuguilla [governor's lechuguilla scrub], 1250 m, *Spellenberg & J. Bacon* 10992 (CIIDIR, NMC).

### ***Bothriochloa* Kuntze**

Perennial; caespitose or stoloniferous. Culms with pithy internodes. Leaves basal or cauline, not aromatic; sheaths open; auricles absent; ligules membranous, sometimes also ciliate; blades usually flat, convolute in the bud. Inflorescences terminal, panicles of subdigitate to racemously arranged branches, each branch with (1)2 to many rames, branches not subtended by modified leaves; rames with spikelets in heterogamous sessile-pedicellate pairs, internodes with a translucent, longitudinal groove, often villous on the margins; disarticulation in the rames, beneath the sessile spikelets. Spikelets dorsally compressed; sessile spikelets with 2 florets; lower glumes rounded, several-veined, sometimes with a dorsal pit, margins clasping the upper glume; upper glumes somewhat keeled, 3-veined; lower florets hyaline scales, unawned; upper florets bisexual; upper lemmas with a midvein that usually extends into a twisted, geniculate awn, occasionally unawned; anthers 3. Pedicels similar to the internodes. Pedicellate spikelets reduced or well-developed, sterile or staminate, unawned. Caryopsis lanceolate to oblong, somewhat flattened; hila punctate, basal; embryos about  $\frac{1}{2}$  as long as the caryopsis.  $x = 10$ .

*Bothriochloa* is a genus of about 35 species that grow in tropical to warm-temperate regions. Nine are native to North America.

### **KEY TO SPECIES OF *BOTHRIOCHLOA***

1. Axis of the inflorescence (rachis) much shorter than racemes; racemes 2–8 per inflorescence; culms 1–2 mm thick in the inferior  $\frac{1}{2}$  ..... *B. springfieldii*
1. Axis of the inflorescence (rachis) 1–2 times as long as the racemes; racemes (8)10–40 per inflorescence; culms generally (1.5)2–4 mm thick near the base.
  2. Inferior racemes generally longer than the panicle axis, the panicle flabellate.
    3. Pedicellate spikelets similar in size and shape to the sessile; lower glumes with a punctiform glandular pit; blades slender 3–4 mm wide; inflorescence bearing 3–7 racemes; plants 20–100 cm tall ..... *B. wrightii*
    3. Pedicellate spikelets shorter and/or narrower than the sessile; lower glume lacking a glandular pit in all spikelets; blades 4–8 mm wide; inflorescence bearing 10–20 racemes; plants 50–150 cm tall ..... *B. barbinodis*
  2. Inferior racemes generally shorter than the panicle axis, the panicle oblong.
    4. Sessile spikelets 4–6 mm long, with a glandular pit ..... *B. perforata*
    4. Sessile spikelets 4(5) mm long, lacking a glandular pit ..... *B. laguroides*



38. *Bothriochloa barbinodis* (Lag.) Herter, Revista Sudamer. Bot. 6(5-6): 135. 1940. *Andropogon barbinodis* Lag., Gen. Sp. Pl. 3. 1816.

FIGURE 36

Culms 60–120 cm tall, rarely more than 2 mm thick, erect, geniculate at the base, often branched at maturity, not glaucous below the nodes; nodes hirsute, the hairs 3–4 mm long, mostly erect to ascending, tan or off-white. Leaves cauline; ligules 1–2 mm long, often erose; blades 20–30 cm long, 2–7 mm wide, not glaucous, glabrous or sparingly pilose near the throat. Panicles 5–14(20) cm on the larger shoots, oblong to somewhat fan-shaped, silvery-white; rachises 5–10 cm long, straight, exerted or partially included in the sheath, with numerous branches; branches 4–9 cm long, erect, with several rames; rame internodes with a membranous groove wider than the margins, margins densely pilose, longest hairs 3–7 mm long, concentrated distally. Sessile spikelets 4.5–7.3 mm; lower glumes short pilose, with or without a dorsal pit; awns 20–35 mm; anthers 0.5–1 mm long, often remaining within the spikelet. Pedicellate spikelets 3–4 mm long, narrowly lanceolate, sterile.  $2n = 180$ .

**DISTRIBUTION AND HABITAT.** *Bothriochloa barbinodis* is a common species, at 500–1,200 m, along roadsides, drainage ways, and gravelly slopes in desert grasslands from the southwestern United States through Mexico and Central America to Bolivia and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 29.4 mi N of Gallego, Sierra Gallego, 18 Jul 1975, 4500 ft, Wallace, Dunn 183 (ENCB); 52.4 mi N of Gallego, Sierra Gallego, 18 Jul 1975, 4500 ft, Wallace, Dunn 167 (ENCB); 12 km al N de Flores Magón, 7 Oct 1995, 1180 m, R. Corral, P. Olivas & J.O. Torres RCD6485 (UACJ). **Ascensión:** a orillas de la carr. [banks of hwy] # 2 Juárez–Janos, km 128, 11 Aug 1996, P. Olivas, R. Rivas & I. Enríquez POS816 (UACJ); por la carr. a Palomas, justo al N del entronque con [just north of the junction with] la carr. a Casas Grandes, 11 Jun 2005, 1183 m, R. Corral, M. Vargas & H. Gutiérrez RCD7130 (UACJ). **Batopilas:** SW Chihuahua, Aug 1885, pastizal [pastureland], 1800 m, E. Palmer 2 (US). **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1990 m, P.M. Peterson, Annable & Valdés-Reyna 10739 (CIIDIR, US). **Buenaventura:** km 11 S Buenaventura, 23 Oct 1954, Hernández-X & C. Tapia N-161 (US). **Camargo:** Arroyo 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, L. H. Harvey 1382 (US); 6 mi W of Piloncillo, rd from Jimenez to Camargo, 24 Sep 1938, I.M. Johnston 7879 (US). **Casas Grandes:** near Casas Grandes, 30 Aug 1899, 2000 m, E.W. Nelson 6342 (US). **Chihuahua:** Chihuahua, 14 Oct 1910,

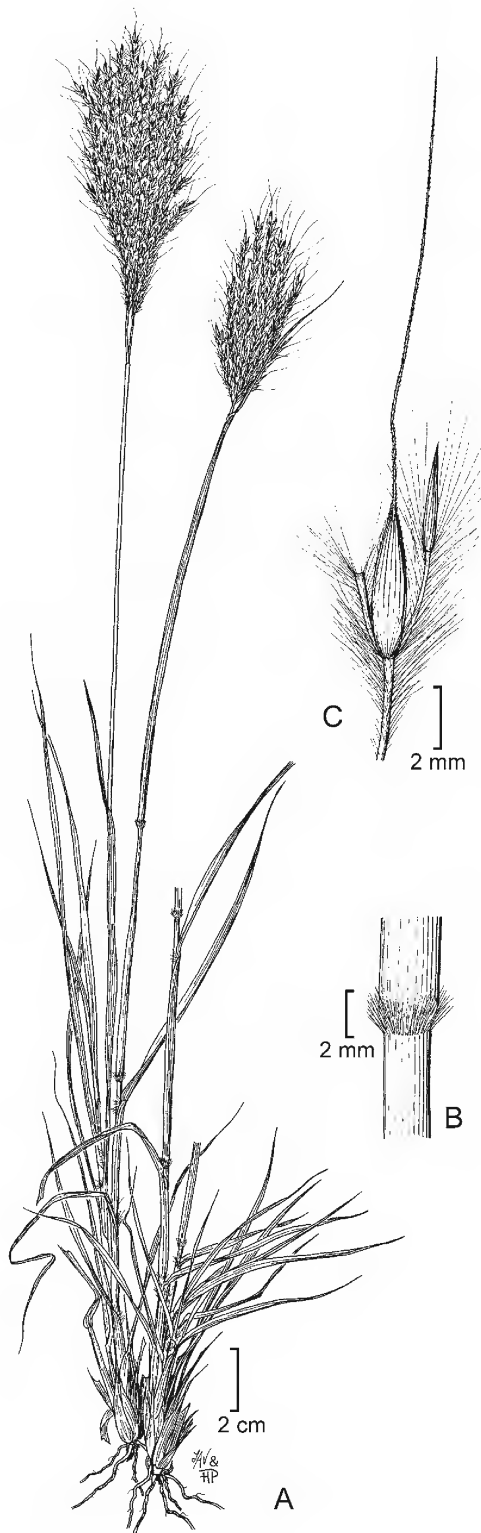


FIGURE 36. *Bothriochloa barbinodis*. A. Habit. B. Node. C. Sessile and pedicellate spikelets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



*Hitchcock* 7798 (US); Rancho Experimental La Campana, 23 Oct 1980, pastizal, 1640 m, *A. Melgoza* 638 (CIIDIR); hills and plains near Chihuahua, 23 Aug 1885, pastizal, 1900 m, *C.G. Pringle* 491(US); km 1773 Carr. a Cd. Juárez, 15 Sep 55, pastizal, 1500 m, *Hern.-Xol. & V. Mathus* N-1813, N-1832 (US); km 28 Cd. Chihuahua–Cd. Cuauhtémoc, 27 Oct 1954, pastizal, 1600 m, *Hern.-Xol. & C. Tapia* N-287 (US); km 20 Cd. Cuauhtémoc de Cd. Chihuahua, 27 Oct 1954, pastizal, 1500 m, *Hern.-Xol. & C. Tapia* N-258 (US); km 14 Cd. Cuauhtémoc de Cd. Chihuahua, 15 Sep 1955, pastizal, 1400 m, *Hern.-Xol. & V. Mathus* N-1785 (US); 6 Oct 1959, *Soderstrom* 904 (US). **El Tule**: 19.3 km SE of Balleza towards Parral, 26 Sep 1988, oak woods, 1800 m, *P.M. Peterson & Annable* 5944 (ENCB, US). **Guerrero**: railroad NW of San Isidro, Sierra Madre Occidental, 18 Sep 1934, 1990-2010 m, *Pennell* 18987 (US). **Guadalupe**: NE Chihuahua, vicinity of Rancho El Pino, ca 10 km, SE of Sierra Rica, 23 Sep 1942, bosque de encino [oak forest], 1100 m, *R. Stewart* 2410 (US). **Janos**: Chihuahua–Sonora border, Rancho Carretas, 27 Aug 1939, bosque de encino, 1780 m, *L. H. Harvey* 1615 (US). **Juárez**: aprox. 7 km al N del poblado [village] de Samalayuca, a los lados [roadside] de la carr., 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5292 (UACJ); km 32 Juárez–Chih., 13 Oct 1997, matorral de gobernadora [governor's scrub], *I. Enríquez, S. Ordoñez & J. Leyva* IEA1 (UACJ). **Ocampo**: Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 15 km from the Cahuisori–Ocampo road on the road to Candamena, 4.3 km below Cruz Verde, 23 Sep 1994, 1570 m, *Spellenberg, Corral & Estrada* 12169 (NMC). **Riva Palacio**: Arroyo del Nido, 1.2 mi by dirt road, E Rancho El Nido, 8 Oct 1982, grassland, 1400 m, *F.W. Reichenbacher* 1325 (ARIZ).

39. *Bothriochloa laguroides* (DC.) Herter, Revista Sudamer. Bot. 6(5–6): 135. 1940. *Andropogon laguroides* Cat., Pl. Horta Mons. 78. 1813.

FIGURE 37

Culms 35–115(130) cm tall, usually less than 2 mm thick, erect or geniculate at the base, branched at maturity; nodes short hirsute with erect hairs, or glabrous. Leaves usually basal to sometimes cauline on robust plants, usually glaucous; ligules 1–3 mm; blades 5–25 cm long, 2–7 mm wide, flat to folded, mostly glabrous. Panicles 4–12(14) cm long, narrowly oblong or lanceolate, silvery-white or light tan; rachises 4–8 cm long, with more than 10 branches; branches 1–5.5 cm long, erect-appressed, rarely with axillary pulvini, lower branches shorter than the rachises, usually with more than 1 rame; rame internodes with a

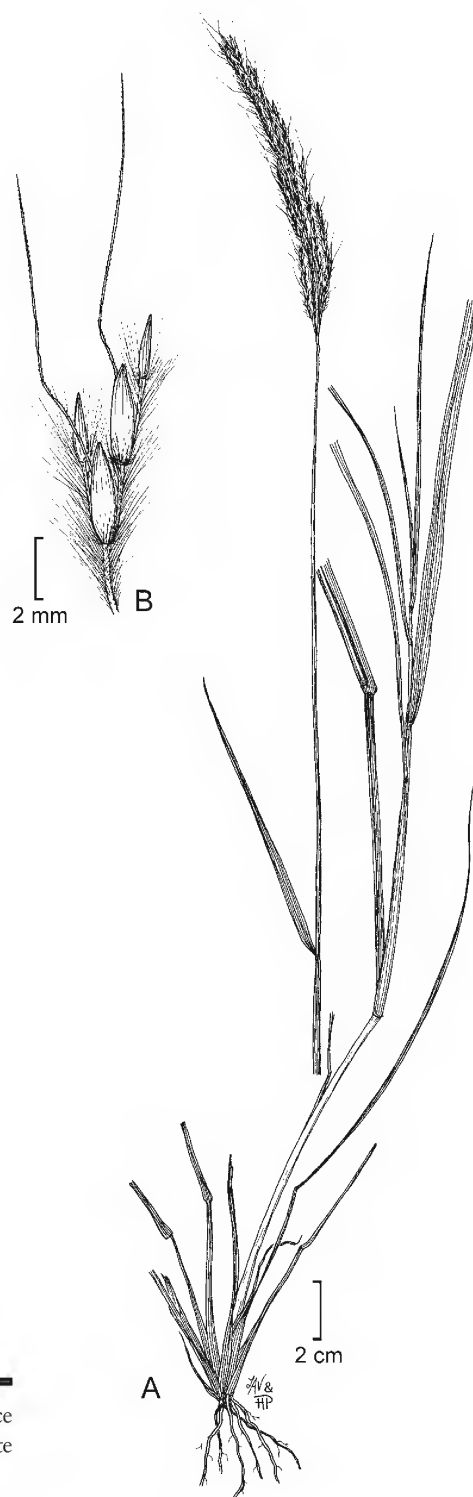


FIGURE 37. *Bothriochloa laguroides* var. *laguroides*. A. Habit. B. Inflorescence branch. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

groove wider than the margins, margins copiously hairy, hairs 3–9 mm long, at least somewhat obscuring the spikelets. Sessile spikelets 2.5–4.5 mm long, ovate, somewhat glaucous, apex blunt; lower glumes glabrous or hirtellous, rarely with a dorsal pit; awns 8–16 mm; anthers 0.6–1.4 mm. Pedicellate spikelets 1.5–2.5(3.5) mm long, shorter than the sessile spikelets, sterile.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Bothriochloa laguroides* grows in well-drained soils of grasslands, prairies, roadsides, river bottoms, and woodlands, often on limestone, usually at 20–2100 m. It has two varieties; *Bothriochloa laguroides* var. *torreyana* (Steud.) M. Marchi & Longhi-Wagner is found in Chihuahua.

*Bothriochloa laguroides* has been confused with *Bothriochloa saccharoides* (Sw.) Rydb., a more southern species that differs from *B. laguroides* in having pilose leaves, a narrow central groove in the internodes and pedicels, and panicle branches with axillary pulvini.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, P.M. Peterson & Annable 5759 (ENCB, US). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22037 (US). **Camargo:** Arroyo 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, L. H. Harvey 1389 (ENCB). **Casas Grandes:** Valle de Las Cuevas al S del Ejido Ignacio Zaragoza, 25 Sep 1982, 1760 m, Tenorio 1709 & Romero de Terreros (ENCB, MEXU). **Cuauhtémoc:** 21 km W of Cuauhtemoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9593 (US). **Ignacio Zaragoza:** 10 mi N of Ignacio Zaragoza, 8 Abr 1977, 7800ft, Dunn, Torke, Bennett & Wieder 22637 (ENCB). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino [oak forest], 1200 m, O. Bravo 1917 (CIIDIR). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, P.M. Peterson & Annable 5966 (ENCB, US).

40. *Bothriochloa perforata* (Trin. ex E. Fourn.) Herter, Revista Sudamer. Bot. 6(5–6): 135. 1940. *Andropogon perforatus* Trin. ex E. Fourn., Mexic. Pl. 2: 59. 1886. *Bothriochloa barbinodis* var. *perforata* (Trin. ex E. Fourn.) Gould, Southw. Naturalist 3: 212. 1959.

Perennial plants, densely tufted. Culms 50–100 cm tall, geniculate at base, nodes plicate-pubescent to short barbed. Sheaths glabrous; ligules 2–3 mm long, membranous, blades 17–30 cm long, 2–4 mm wide, attenuate to the apex, flattened, glabrous or sparsely pilose adaxially; inflorescences 5–10 cm long, oblong, subtended by the superior sheath, racemes 4–8, 5–7 cm long, pseudo-digitate, agglomerate in a short rachis, straight, union of the rachis and pedicels densely long-viloses; sessile spikelets 4–6 mm long, bisexual, short pilose at base; lower glumes 4–6 mm long, scarce-pilose, with a pit at central part, upper glumes glabrous; bisexual lemmas 2.3–2.6 mm long, awn 18–25 mm long,

geniculate, twisted below; pedicellate spikelets 3.8–4 mm long, sterile, with only 1 floral wrap, unawned, coriaceous.

**DISTRIBUTION AND HABITAT.** *Bothriochloa perforata* grows in pine forests, oak–juniper forests, desert scrub, and grasslands at elevations of 2,150–2,616 m. Known from United States, Mexico, and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Jiménez:** carr. [hwy] 45 Parral-Torreón, 20 km al N de Río Florido, 15 Sep 1970, 1850 m, L.Ma. Villarreal 3690 (ENCB).

41. *Bothriochloa springfieldii* (Gould) Parodi, Gram. Bonaer. (ed. 5): 120. 1958.

FIGURE 38

Culms 30–80 cm long, erect, unbranched; nodes prominently bearded, hairs 3–7 mm long, spreading, silvery-white. Leaves mostly basal; ligules 1–2.5 mm long; blades 5–30 cm long, 2–3(5) mm wide, flat to folded, glabrous or sparsely hirsute adaxially, pilose near the throat. Panicles 4–9 cm long, oblong to fan-shaped; rachises 1–5 cm long, with 2–9 branches; branches 4–8 cm long, longer than the rachises, with 1(2) rames; rame internodes with a membranous groove wider than the margins, margins densely white-villous, hairs 5–10 mm long, obscuring the sessile spikelets. Sessile spikelets 5.5–8.5 mm long, lanceolate; lower glumes densely short-pilose on the lower ½, sometimes with a dorsal pit; awns 18–26 mm long; anthers 1–1.5 mm long. Pedicellate spikelets 3.5–5.5 mm long, sterile.  $2n = 120$ .

**DISTRIBUTION AND HABITAT.** *Bothriochloa springfieldii* grows in rocky uplands, ravines, plains, sandy areas, and roadsides from southern Utah to western Texas and Mexico at 900–2,500 m and, as a disjunct, in northwest Louisiana. It differs from *B. barbinodis* in its less robust habit, narrower blades, longer nodal hairs, and fewer, more hairy panicle branches.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 28 km al sur [S] de Samalayuca, 21 Oct 74, pastizal halófito [halophyte grassland], 1400 m, Valdés-Reyna VR-793 (RELC). **Chihuahua:** La Campana; 1 km Pte. Carr. [hwy] Pan-americana, 14 Sep 73, Pastizal mediano abierto [mostly open grassland], 1570 m, Valdés-Reyna VR-274 (RELC). **Cusihiuirachi:** Río Papigochi 40 km de Cuahutémoc, carr. Cuahutémoc–Ocampo, 8 Aug 1975, pastizal mediano abierto, 2100 m, J.M. Peña JMP-84 (RELC).

42. *Bothriochloa wrightii* (Hack.) Henrard, Blumea 4(3): 520. 1941. *Andropogon wrightii* Hack., Flora 68(8): 139. 1885.

FIGURE 39

Culms to 70 cm long, erect, sparingly branched; nodes glabrous or hirsute, hairs about 1 mm. Leaves cauline, glaucous; ligules 1–2 mm; blades 15–25 cm long, 3–7 mm wide, glabrous. Panicles 5–6 cm long, oblong to fan-shaped; rachises 1–3 cm long, with 4–5 branches; branches 4–6 cm long, lacking axillary pulvini, with 1 raceme; raceme internodes with stiff, 1–3 mm

FIGURE 38. *Bothriochloa springfieldii*. A. Habit. B. Node. C. Sessile and pedicellate spikelets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

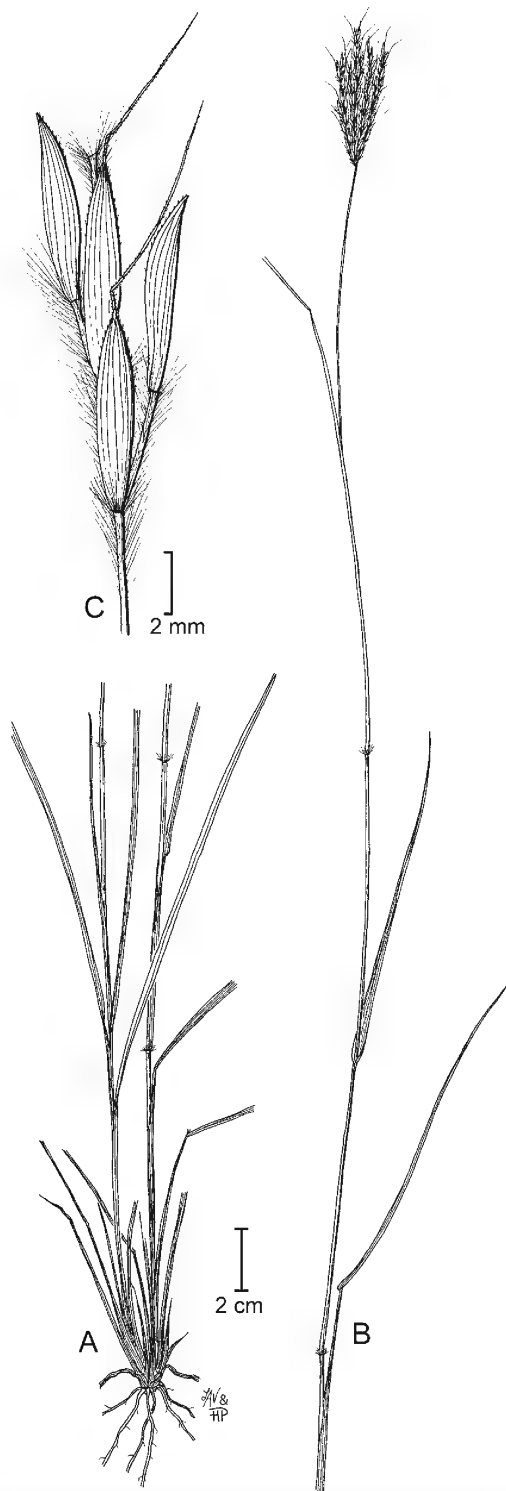
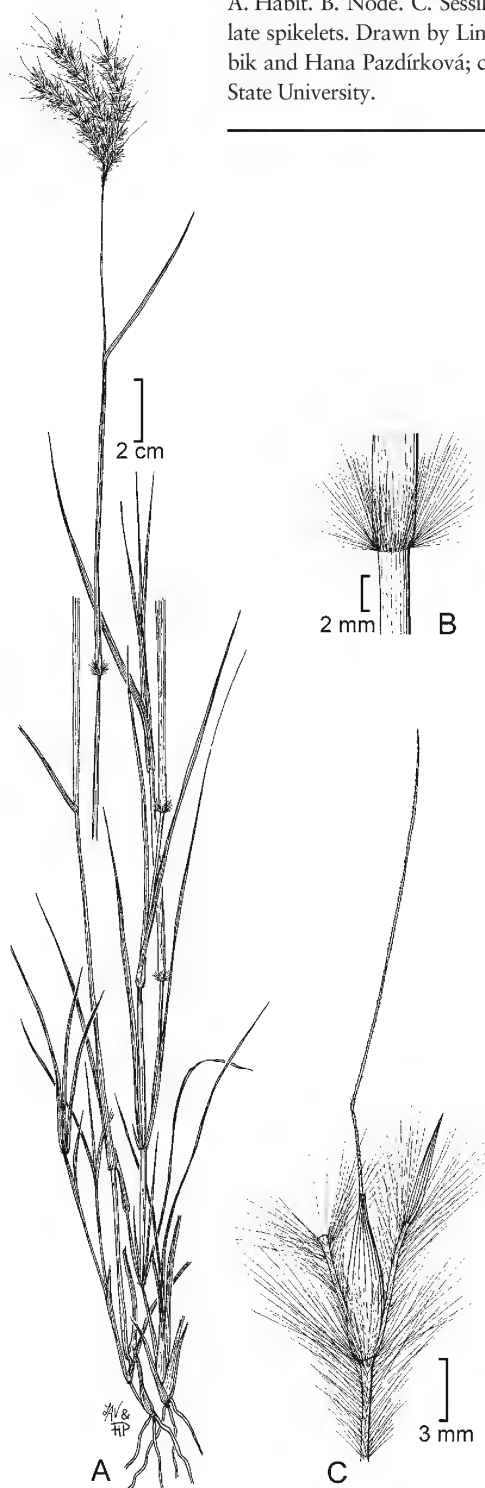


FIGURE 39. *Bothriochloa wrightii*. A. Habit. B. Culm and inflorescence. C. Inflorescence branch. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

marginal hairs. Sessile spikelets 5.5–7 mm long, lanceolate-elliptic; lower glumes glabrous, usually without a dorsal glandular pit; awns 10–15 mm long, twisted, once-geniculate; anthers about 3 mm. Pedicellate spikelets staminate, subequal to the sessile spikelets.  $2n = 120$ .

**DISTRIBUTION AND HABITAT.** *Bothriochloa wrightii* grows in rocky grasslands and shrubby slopes of the pine-oak woodlands of southern Arizona, New Mexico, Texas, and northern Mexico at 1,200–1,800 m. It was last collected in the United States in 1930. It differs from *B. barbinodis* in its glaucous foliage, short, fan-shaped panicles, and large, pedicellate spikelets.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Buenaventura:** km 11 S Buenaventura, 23 Oct 1954, *Hern.-Xol. & C. Tapia* N-164, 215 (US); *J. Passini & M.F. Robert* 6580 (ENCB). **Cuauhtémoc:** Between Chihuahua City and Cuauhtémoc, 15 Oct 1954, 1750 m, *R.G. Reeves, J. Morrow & R.Q. Landers s.n.* (ARIZ). **Cusihuiriacchi:** Mesas near Cusihuiriacchi, 27 Aug 1887, *C.G. Pringle* 1409 (US). **Chihuahua:** Chihuahua, 14 Oct 1886, *C.G. Pringle* 1122 (US). **Ignacio Zaragoza:** 17.9 mi N of Ignacio Zaragoza, 8 Apr 1977, 7000 ft, *Dunn, Bennett, Torke & Wieder* 22647 (ENCB). **Namiquipa:** Tepehuanes, pastizal amacollado [grass pasture], 2200 m, *G. Gómez s/n* (RELC).

### ***Bouteloua* Lag.**

Annual or perennial; synoecious; habit various, caespitose, stoloniferous, or rhizomatous. Leaves usually mostly basal; sheaths open; ligules of hairs, membranous, sometimes

ciliate. Inflorescences terminal, panicles of 1–80 solitary, spike-like branches, exceeding the upper leaves; branches not woody, 1-sided, usually racemose on elongate rachises, sometimes digitate or subdigitate, with 1–130 sessile to subsessile spikelets in 2 rows, axes terminating in a spikelet or extending beyond the base of the distal spikelet. Spikelets closely imbricate, appressed to pectinate, laterally compressed or terete, with 1–2(3) florets, lowest floret in each spikelet bisexual, distal florets staminate or sterile; disarticulation at the base of the branches or above the glumes. Glumes unequal or subequal, 1 or both glumes equaled or exceeded by the distal floret, 1-veined, acute or acuminate, sometimes shortly awned; lower glumes usually shorter than the lowest floret; lemmas of lowest florets entire, 2-, 3-, or 4-lobed, 3-veined, veins usually extended into 3 short awns; paleas of lowest florets 2-veined, veins sometimes excurrent; distal floret(s) staminate or sterile, similar to the lowest floret in shape, size, and venation to sterile and reduced to an awn column with well-developed awns or to a flabellate scale.  $x = 10$ .

*Bouteloua*, a genus of the Western Hemisphere with its center of diversity in Mexico, has 60 species (Herrera Arrieta et al., 2004, 2008; Peterson et al., 2015). There are 26 species of *Bouteloua* in Chihuahua, all native. Several species are important forage grasses, and some are important constituents of the native Mexican grasslands. Two that are particularly important in Mexico and Chihuahua are *B. curtipendula* and *B. gracilis*. These were major constituents of the shortgrass prairie that once covered the drier portions of the Great Plains. Both are excellent forage species.

### KEY TO SPECIES OF *BOUTELOUA*

1. Unisexual spikelets on dioecious or monoecious plants; pistillate spikelets different in form and size to the staminate . . . . . *B. dactyloides*
1. Bisexual spikelets, all similar in form and size.
  2. Spikelets 3 per spike (branch); central spikelet shortly-stipitate, 3-flowered, first floret bisexual, the laterals staminate.
    3. Culms generally more than 15 cm tall; blades 3–12 cm long; lateral spikelets well-developed, staminate . . . . . *B. erecta*
    3. Culms less than 15 cm tall; blades 1–5 cm long; lateral spikelets reduced rarely staminate but with reduced lemmas . . . . . *B. diversispicula*
  2. Spikelets (1)2 to several per spike (branch); or with 1 to 2 (3) rudiments, these sometimes represented by an awn.
    4. Spikes falling when mature, bearing 1–12 spikelets; spikelets persistent on the spikes.
      5. Inflorescence branches (spikes) mostly with 1 spikelet alone . . . . . *B. uniflora*
    5. Inflorescence branches (spikes) with 2–22 spikelets.
      6. Spikes 20–80 per culm, if less than 15, then the spikes less than 1 cm long.
        7. Spikes 9–25(35) per culm, 8–10 mm long, bearing 2–6 spikelets; central awn of the rudiment 2.5–5 mm long . . . . . *B. warnockii*
        7. Spikes 20–80 per culm, 10–30 mm long, bearing 2–13(20) spikelets; central awn of the rudiment 5–10 mm long.
          8. Culms with 4–7 nodes; upper glumes 3.5–5.5 mm long; inflorescences both terminal and axillary, the terminal bearing 5–13 spikelets . . . . . *B. media*
          8. Culms with 1 or 2(3) nodes; upper glumes 5.5–8 mm long; inflorescences only terminal, bearing 2–6 spikelets . . . . . *B. curtipendula*
    6. Spikes 1–15 per culm, if up to 20 then more than 1 cm long.
      9. Annual plants; rudimentary florets typically reduced to a cylindrical column with 3 awns, these 5–8 mm long; spikelets appressed to the branch axis, widely spaced along the inflorescence rachis . . . . . *B. aristoides*

9. Perennial plants; rudimentary florets well-developed, staminate or neutral, when 3-awned the awns of variable sizes; spikelets appressed or spreading from the branch axis, not widely separated from each other.
10. Spikes bearing 2–5 spikelets; upper glume hairy.
  11. Inflorescence 7–15 cm long; spikelets 4–6.5 mm long; lower glume  $\frac{3}{4}$  as long as the upper glume; awns of rudimentary floret 1–3 mm long ..... *B. eludens*
  11. Inflorescence 3–6 cm long; spikelets 7–10 mm long; lower glume  $\frac{1}{2}$  as long as the upper glume; awns of rudimentary floret 7–10 mm long ..... *B. chihuahuana*
10. Spikes bearing 5–20 spikelets; upper glabrous or hairy.
  12. Leaf blades involute along entire length, apically rigid and spine-like, densely lanate-pubescent adaxially and glabrous at maturity ..... *B. johnstonii*
  12. Leaf blades flat, at least the proximal  $\frac{1}{2}$ , the distal  $\frac{1}{2}$  often involute at maturity, the apex never rigid or spine-like, glabrous, hirsute or bearing papillose hairs adaxially.
  13. Rachis of spikes and upper glume dorsally hairy; spikes 3–8, 7–10 mm long ..... *B. chondrosioides*
  13. Rachis of spikes and upper glume glabrous to scabrous; spikes 5–12, 15–40 mm long.
  14. Spikes 2–5(7) cm long with (9)12–22 spikelets, inserted to near the apex of the spike .... *B. williamsii*
  14. Spikes 1.5–3.0 cm long with 5–12 spikelets, inserted on the lower  $\frac{1}{2}$ – $\frac{3}{4}$  of the spike.
  15. Plants with well-developed rhizomes, hard and knotty; spikelets 9–13 mm long ..... *B. radicata*
  15. Plants without rhizomes; spikelets 6–9 mm long ..... *B. repens*
4. Spikes persistent, bearing 20–60 spikelets; spikelets deciduous from the spikes.
  16. Inflorescence of a single unilateral spike.
  17. Annual plants, generally small, 7–23 (35) cm tall; few-leaved ..... *B. simplex*
  17. Perennial plants, generally greater than 25 cm tall; many-leaved.
    18. Spike rachis prolonged 2–10 mm beyond the insertion of the distal spikelet, ending in a semi-rigid needle; upper glumes with papillose-based hairs, at least in some spikelets.
    19. Blades 1.5–5 cm long, evidently distichous, rigid, distributed homogeneously along the culm; plants generally glabrous, except pubescent on the adaxial surface of the leaf blade; spikelets 3–3.5 mm wide, the rachis prolonged 2–5 mm beyond the distal spikelet ..... *B. breviseta*
    19. Blades 5–18 cm long, not distichous; plants hirsute; spikes 6–9 mm wide, the rachis prolonged 5–10 mm beyond the distal spikelet ..... *B. hirsuta*
  18. Spike rachis not extending beyond the distal spikelet insertion; upper glume pubescent or glabrous.
    20. A single spike per culm; rachis of spike and upper glume glabrous to scabrous, the rachis clearly arched ..... *B. scorpioides*
    20. 1–3(4) spikes per culm; rachis of spike and upper glume pilose or hirsute, often with long papillose-based hairs, the rachis straight ..... *B. gracilis*
16. Inflorescence of 2 or more unilateral spikes.
  21. Upper glumes (at least in some spikelets) hirsute with papillose-based hairs.
  22. Spike rachis prolonged 2–10 mm beyond the distal spikelet insertion.
    23. Blades 1.5–5 cm long, evidently distichous, rigid, distributed homogeneously along the culm; plants generally glabrous, except pubescent on the adaxial surface of the leaf blade; spikelets 3–3.5 mm wide, the rachis prolonged 2–5 mm beyond the distal spikelet ..... *B. breviseta*
    23. Blades 5–18 cm long, not distichous; plants hirsute; spikes 6–9 mm wide, the rachis prolonged 5–10 mm beyond the distal spikelet ..... *B. hirsuta*
  22. Spike rachis not prolonged beyond the distal spikelet insertion.
    24. Lemma 3.5–4 mm long; spikes 3–8, 1–3 cm long; plants caespitose or stoloniferous, never rhizomatous ..... *B. parryi*
    24. Lemma 4–5.5 mm long; spikes 2 or 3(6), 1.3–5(7) cm long; plants subrhizomatous ..... *B. gracilis*
21. Upper glumes glabrous or pubescent but the hairs never papillose-based.
  25. Culm internodes lanose-pubescent, at least below; base of rachis and branches lanose-pubescent ..... *B. eriopoda*
  25. Culm internodes glabrous; base of rachis and branches glabrous.
  26. Annual ..... *B. barbata*



- 26. Perennial.
  - 27. Inflorescence with 2 or 3(4) spikes.
    - 28. Culms conspicuously branched, geniculate, usually with 4 to 5 nodes, bearded on the branch axiles . . . . . *B. ramosa*
    - 28. Culms never branched, erect, usually with 1 or 2(3) nodes, glabrous on the branch axils . . . . . *B. gracilis*
  - 27. Inflorescence with 3–30 spikes.
    - 29. Plants rhizomatous to subrhizomatous.
      - 30. Spikelets 3–4.5 mm long; plants strongly rhizomatous . . . . . *B. karwinskii*
      - 30. Spikelets 5–6.5 mm long; plants subrhizomatous.
        - 31. Lemma of bisexual floret glabrous to scaberulous with 3 awns; spikelets inserted on rachis in zigzag fashion . . . . . *B. trifida*
        - 31. Lemma of bisexual floret pubescent at the base with a single awn; spikelets inserted on rachis in straight or arched fashion . . . . . *B. gracilis*
    - 29. Plants not rhizomatous.
      - 32. Lemma of bisexual floret glabrous to scaberulous with 3 awns; spikelets inserted on rachis in zigzag fashion . . . . . *B. trifida*
      - 32. Lemma of bisexual floret pubescent at the base with a single awn; spikelets inserted on rachis in straight or arched fashion.
        - 33. Lemma of bisexual floret bearded below and pilose on the veins, hairs 0.5–0.8 mm long; spikes 2 or 3(6), 1.3–5(7) cm long bearing 40–80 spikelets . . . . . *B. gracilis*
        - 33. Lemma of bisexual floret slightly pubescent below, at least on the basal margins and not pilose on the veins; spikes (2)4–9(11), 1–3 cm long, bearing 20–55 spikelets . . . . . *B. barbata*

43. *Bouteloua aristidoides* (Kunth) Griseb., Fl. Brit. W. I. 537. 1864. *Dinebra aristidoides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 171. 1815.

FIGURE 40

Annual; tufted. Culms 4–60 cm tall, outer culms of a tuft decumbent, sometimes geniculate, branched at the lower nodes. Ligules 0.2–0.5 mm long, membranous, lacerate or ciliate; blades 2–5(9) cm long, 0.7–2 mm wide, flat or folded, adaxial surfaces sometimes with papillose-based hairs, margins usually with papillose-based hairs near the ligules. Panicles 2.5–10.5 cm long, with (1)4–15 widely spaced branches; branches 5–45 mm long, deciduous, densely pubescent (at least basally), with 2–10 spikelets per branch, the spikelets appressed, axes extending 2–10 mm beyond the base of the terminal spikelets, apex entire; disarticulation at the base of the branches, the break forming a sharp tip. Spikelets appressed. Proximal spikelet on each branch with 1 floret; lower glumes 1.5–3.5 mm long, glabrous, narrow to subulate; upper glumes 5.5–6.2 mm long, densely pubescent, at least on the basal ½; lemmas 5.8–6 mm long, acuminate, unawned; lowest paleas almost as long as the lemmas, bifid, glabrous; rachillas prolonged beyond the florets for about 0.5 mm. Distal spikelets with 1 bisexual and 1 rudimentary floret; glumes unequal, glabrous, minutely scabrous on the keels; narrowly acute or acuminate; lower glumes 1.5–2 mm; upper glumes 5–6 mm long, glabrous or sparsely pubescent basally, often divergent; lowest lemmas 6–8 mm long, veins pubescent, lateral veins excurrent as short (to 1 mm) awns, acuminate, midvein extended into a setaceous tip or a short awn; lowest paleas 5–7 mm long,

bifid, veins often excurrent as short awns; anthers about 2.5 mm long, yellow or yellow and red; distal florets reduced to a pubescent, 3-awned, awn column, awns 2–7 mm long, exserted. Caryopsis 2.5–3 mm long,  $2n = 40$

There are two varieties; only the typical variety grows in Chihuahua.

**DISTRIBUTION AND HABITAT.** *Bouteloua aristidoides* var. *aristidoides* grows in dry mesas, plains, and washes from near sea level to about 2,000 m. Its range extends from California to west Texas and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 51 (US). **Buenaventura:** 7 km al S de Buenaventura, 5 Sep 76, pastizal con [pastureland with] *Opuntia*, 1574 m, *A. Melgoza* 348 (RELC). **Camargo:** Low ridge 1 mi SW of Mestefías, 5 Oct 1941, 1380 m, *R. Stewart* & *I.M. Johnston* 2022 (US); Vicinity of Colina, SW of Carmargo, 6 Sep 1967, *Reeder* & *C. Reeder* 4865 (ARIZ-4893, US); Road from Camargo to Mestefías, 11 mi NE of Camargo, 24 Sep 1938, *I.M. Johnston* 7904 (US); Sierra de los Organos, 8 Sep 1937, *LeSueur* 0163 (US). **Casas Grandes:** near Casas Grandes, 30 Aug 1899, *E.W. Nelson* 6329 (US). **Chihuahua:** near Chihuahua, 18 Sep 1885, *C.G. Pringle* 477 (US); 26 Aug 1939, *L. H. Harvey* 1599 (US); La Campana: potrero [paddock] El Plan, 4 km Ote. [W] carr. [hwy] Panamericana, 6 Sep 73, lotes productores de semilla [seed-production lots], 1500 m, *Valdés-Reyna VR-116* (RELC). **Coyame:** 1 mi W of Cuchillo Parado along Rio Conchos, 17 Sep 1971, clay margins of Rio Conchos, 1560 m, *J. Henrickson* 6769 (ARIZ). **Hidalgo del Parral:** Just S of Parral, 2 Oct 1959, *Soderstrom* 831 (US). **Jiménez:** San Pedro Conchos,

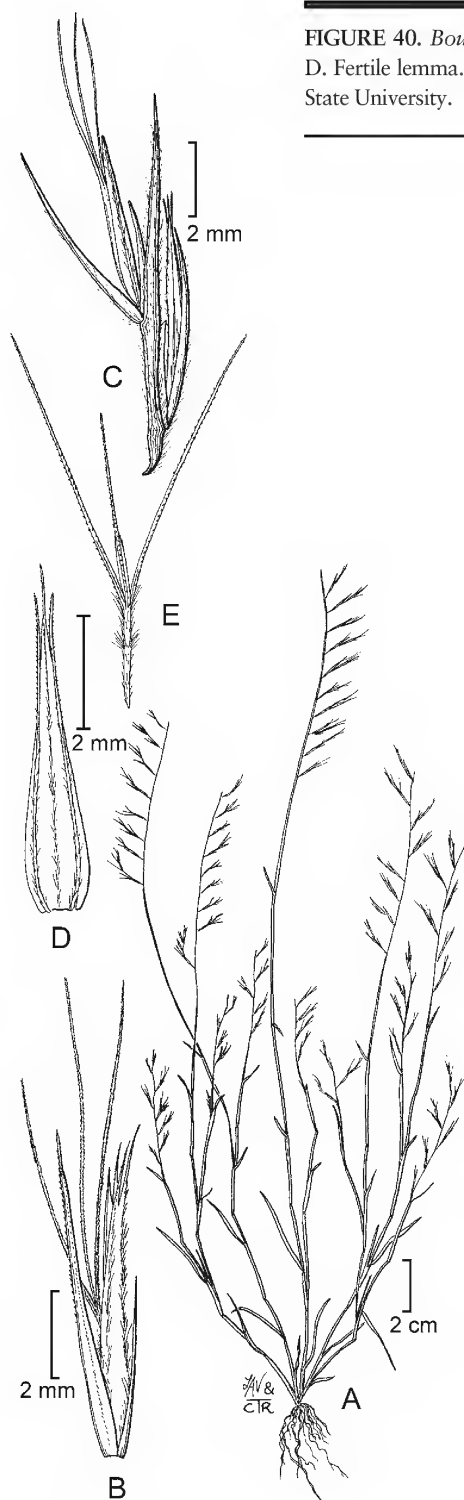


FIGURE 40. *Bouteloua aristidoides* var. *aristidoides*. A. Habit. B. Spikelet. C. Inflorescence branch. D. Fertile lemma. E. Sterile lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

16 Aug 1939, F. Shreve 9070 (US); Sierra de Sta Eulalia, 18 Aug 1939, L. H. Harvey 1526 (US); Banks of the Río Florido, Cd. Jiménez, 28 Jul 1939, L. H. Harvey 1323 (US); 33 mi SE of Jiménez, 27 Sep 1963, Reeder & C. Reeder 3614 (ARIZ); Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, D. Noya & M.L. Juárez 3407 (CIIDIR). Juárez: carr. No. 2 Juárez-Janos, km 42, 11 Aug 1996, matorral de médanos [scrub dunes], 1250 m, P. Olivas, R. Rivas & I. Enríquez POS786 (UACJ); 23 km al S del poblado [village] de Samalayuca, por la carr. Panamericana, 9 Sep 1995, 1250 m, R. Corral & P. Olivas RCD6344 (UACJ). Manuel Benavides: E Chihuahua, vicinity of Pirámide, 11 Aug 1941, I.M. Johnston 8117 (US). Mcoqui: Mcoqui, 24 Aug 1935, LeSueur Mex-029 (US).

**44. *Bouteloua barbata* Lag., Varied. Ci. 2(4): 141. 1805.**

Annual or short-lived perennial; tufted, sometimes with stolons. Culms 1–75 cm tall, prostrate, decumbent, or erect, sometimes rooting at the lower nodes; lower internodes glabrous. Leaves basal or cauline; sheaths usually glabrous, except for tufts of long hairs on either side of the collars; ligules 0.5–2 mm long, membranous, ciliate; blades 0.5–10 cm long, 0.7–4 mm wide, adaxial surfaces usually sparsely pubescent with a few papillose-based hairs basally. Panicles 0.7–25 cm long, with (2)4–9(11) branches; branches 10–30 mm long, persistent, straight to arcuate, glabrous, scaberulous, or with papillose-based hairs, with 20–55 spikelets, axes terminating in a well-developed spikelet; disarticulation above the glumes. Spikelets 2.5–5 mm long, pectinate, with 1 bisexual and 2 rudimentary florets; glumes unequal, glabrous, sometimes scaberulous, apex sometimes shortly bilobed, acuminate or mucronate; lower glumes 0.7–1.5 mm; upper glumes 1.5–2.5 mm long, glabrous, scabrous, or strigose, hairs not papillose-based; lowest lemmas 1.7–4 mm long, densely pilose, at least on the margins, 3-awned, awns 0.5–3 mm long, central awns flanked by 2 membranous lobes; lowest paleas 1.5–4 mm long, pubescent on the margins, 4-lobed, 2-awned, awns 1–2 mm; anthers 0.4–0.7 mm; rachilla internodes subtending second florets terminating in a dense tuft of hairs; second florets rudimentary, 1.5–4 mm long, 2-lobed, lobes rounded, 3-awned, awns 0.5–4 mm long; rachilla internodes subtending third florets with glabrous or puberulent apex; third florets rudimentary, flabellate, unawned. Caryopsis to 1 mm.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua barbata* extends from the southwestern United States to southern Mexico. There are three varieties of *B. barbata*; two of them grow in Chihuahua.

KEY TO VARIETIES OF *BOUPELOUA BARBATA*

1. Annual; culms usually decumbent and geniculate, occasionally rooting at the lower nodes; ligule a hairy fringe 0.5–1 mm long with glabrous auricles; anthers yellow-reddish ..... *B. barbata* var. *barbata*
1. Plants short-lived perennials; culms erect from the base; ligule a hairy fringe 1–2 mm long with pubescent auricles; anthers orange ..... *B. barbata* var. *rothrockii*

*Bouteloua barbata* var. *barbata*

**DISTRIBUTION AND HABITAT.** *Bouteloua barbata* var. *barbata* grows in loose sands, rocky slopes, and washes, often on disturbed soils, usually at elevations below 2,000 m. Its range extends from the southwestern United States to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** Villa Ahumada, 10–20 Oct 1935, *LeSueur* Mex-065 (US); aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, *R. Corral*, *P. Olivas* & *J.O. Torres* RCD6480 (UACJ); Al N cerca [near] de Villa Ahumada, 25 Oct 54, duna de pastos [dune pasture], 1100 m, *Hern.-Xol.* & *C. Tapia* N-173 (RELC, US); 1 km al N del rancho Santa Fé, 18 Oct 74, matorral micrófilo [microphytic scrub], 1400 m, *Valdés-Reyna* VR-652 (RELC). **Buenaventura:** km 11 San Buenaventura–El Carmen, 23 Oct 1954, *Hern.-Xol.* & *Tapia* N-134 (US); 7 km al S de Buenaventura, 5 Sep 76, Pastizal con [pastureland with] *Opuntia*, 1574 m, *A. Melgoza* 548 (RELC). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, *L. H. Harvey* 1386 (US); E Chihuahua, 4.5 mi NW of San Francisco, road from Jaco to Mesteñas, 5 Oct 1941, matorral xerófilo [xerophilous scrub], 1400 m, *R. Stewart* & *I.M. Johnston* 2010 (US); Vicinity of Colina SW of Camargo, 6 Sep 1967, *Reeder* & *C. Reeder* 4866 (ARIZ, US). **Casas Grandes:** alrededores del pueblo [around the village], 28 Aug 2013, 30°11'58.7"N, 108°02'13.3"W [30.19964°N, 108.03694°W], pastizal con dominancia de anuales [pastureland with annuals dominant], *E. Mata Ortiz s.n.* (UACH). **Chihuahua:** near Chihuahua, 23 Aug 1885, *C.G. Pringle* 490 (US); *Hitchcock* 7782 (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, grassland, 1463 m, *Soderstrom* 905 (US); Hacienda Santa Gertrudis, criadero [hatchery] número 2 caballería Ejercito Nacional [national army cavalry], 21 sep 55, 1650 m, *Hern.-Xol.* & *V. Mathus* N-1996 (US); La Campana, Potrero del Plan, 4 km Ote. [W] carr. [hwy] Panamericana, 6 Sep 73, lotes producción de semilla [seed-production lots], 1500 m, *Valdés-Reyna* VR-117 (RELC). **Gran Morelos:** km 20 Cd. Cuauhtémoc de Cd. Chihuahua, 27 Oct 1954, pastizal, 1500 m, *Hern.-Xol.* & *C. Tapia* N-257 (US). **Hidalgo del Parral:** 2 mi E S of Parral on road to Cd. Juarez, 3 Oct 1959, *Soderstrom* 859 (US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, 1460 m, *L. H. Harvey* 1598 (US). **Jiménez:** Sierra de Santa Eulalia, 18 Aug 1939, *L. H. Harvey* 1525 (US); Banks of the Río Florido, Cd. Jiménez, 28 Jul 1939, *L. H. Harvey* 1319 (US); 33 mi SE of Jiménez, 27 Sep 1963, *Reeder* & *C. Reeder* 3616 (ARIZ); Reserva de la Biosfera de Mapimí, dunas de arena [sand dunes] La Soledad, 9 Jul 1997, matorral xerófilo, 1140 m, *A. García* 2703 (CIIDIR); Reserva de la Biosfera de Mapimí, rancho La Soledad, 9 Jul 1997, matorral

xerófilo, 1113 m, *A. García* 2640 (CIIDIR); Reserva de la Biosfera de Mapimí, laguna Palomas, 31 Oct 1998, matorral xerófilo, 1055 m, *A. García* 3177 (CIIDIR); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez* & *M.L. Juárez* 3379 (CIIDIR). **Juárez:** 1 km al S de Carr. Fed. No. 2 en el km 25, matorral de dunas arenosas [sand dune scrub] (Izotal con mesquite), 29 Aug 1997, 1150 m, *A. Aquino* AA78 (UACJ); Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [meadow grass and irrigation channels], 1120 m, *R. Corral* RCD6291 (UACJ); carr. No. 2 Juárez–Janos, km 42, 11 Aug 1996, matorral de médanos [ditch scrub], 1250 m, *P. Olivas*, *R. Rivas* & *I. Enríquez* POS792 (UACJ); a orillas [roadside] de la Carr. No 2 Juárez–Janos, km 128, 11 Aug 1996, *P. Olivas*, *R. Rivas* & *I. Enríquez* POS812 (UACJ); al W de Sierra Juárez, 1 km al W de El Parabién, 27 Aug 1997, matorral de dunas arenosas, Izotal con mesquite, 1200 m, *A. Aquino* AA54 (UACJ). **Meoqui:** along hwy 45, SE of city of Chihuahua, in town of Meoqui, 25 Sep 2004, matorral xerófilo, 1140 m, *R.M. King* & *R.M. Garvey* 13466 (CIIDIR). **Ojinaga:** E Chihuahua, 5.5 mi S of Ojinaga, road from Ojinaga S to Alamos Chapo, 9 Aug 1941, matorral xerófilo, 1100 m, *I.M. Johnston* 8006 (US).

*Bouteloua barbata* var. *rothrockii* (Vasey) Gould, Ann. Missouri Bot. Gard. 66(3): 403. 1979.

## FIGURE 41

**DISTRIBUTION AND HABITAT.** *Bouteloua barbata* var. *rothrockii* grows on dry slopes and sandy flats, mostly at 750–1,700 m. It grows throughout the southwestern United States and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 30 Aug 1939, 1460 m, *L. H. Harvey* 1642 (US). *Reeder*, *C. Reeder* & *Soderstrom* 3491 (US).

45. *Bouteloua breviseta* Vasey, Contr. U.S. Natl. Herb. 1(2): 58. 1890.

## FIGURE 42

Perennial; sometimes caespitose, sometimes rhizomatous, rhizomes 1–3 mm thick, short or elongate, scaly. Culms 20–40 cm tall, erect, somewhat woody at the base, branching at the base and, in late fall, sometimes at the aerial nodes; nodes usually 4–5; internodes glabrous, distal portions of the lower internodes with a thick, white, chalky bloom. Ligules 0.1–0.2 mm long, of hairs; blades 1–4(7) cm long, 0.5–2 mm wide, flat basally, involute and arcuate to reflexed distally. Panicles 2–4 cm

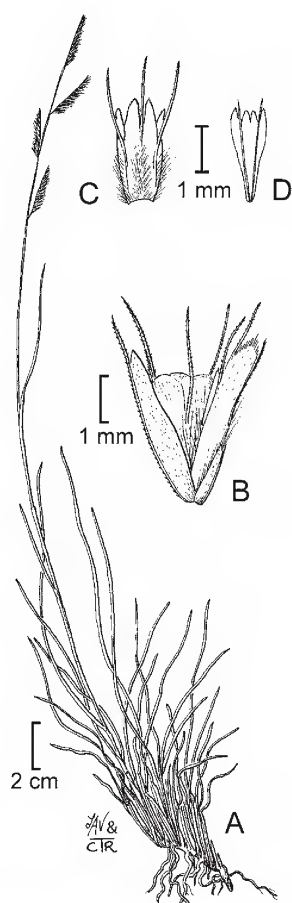


FIGURE 41. *Bouteloua barbata* var. *rothrockii*. A. Habit. B. Spikelet. C. Lower lemma. D. Lower palea. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

long, with 1–3(4) branches; branches 15–37 mm long, persistent, straight to slightly arcuate, mostly appressed, stramineous, with 30–45 spikelets, branches terminating in a reduced, needlelike, 2–5 mm spikelet; disarticulation above the glumes. Spikelets pectinate, with 1 bisexual floret and 1–2 rudimentary florets; glumes acute to acuminate, glabrous or sparsely short-hairy, hairs not papillose-based; lower glumes 2–2.5 mm; upper glumes 2–3.5 mm; lowest lemmas 2.5–4 mm long, sparsely to densely hairy, 3-awned, awns slightly shorter than the lemma bodies, central awns flanked by 2 membranous lobes; lowest paleas about 4.5 mm long, mostly or completely glabrous, sometimes puberulent distally, acute to acuminate, unawned, veins not excurrent; second florets about 4.5 mm long, 3-awned, awns 3–5 mm long; rachilla internodes subtending second florets with densely pubescent apex; third florets, if present, flabellate scales, 1-awned. Caryopsis 1–1.2 mm long, about 0.4 mm wide.  $2n = 20$ .

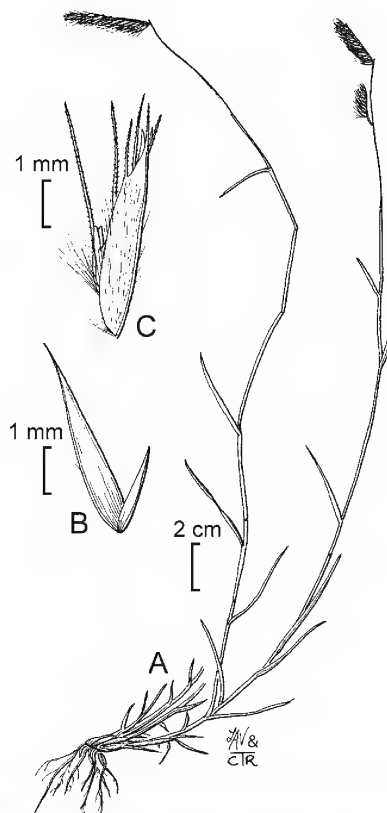


FIGURE 42. *Bouteloua breviseta*. A. Habit. B. Glumes. C. Lower floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Bouteloua breviseta* is locally abundant on gypsum soils in southeastern New Mexico and Texas. It also grows in the state of Chihuahua, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Coyame:** km 100 carr. [hwy] Chihuahua–Ojinaga, 18 Oct 74, matorral [scrub] de lechugilla, 1650 m, *Valdés-Reyna* VR-718 (RELC). **Ahumada:** Médanos de Samalayuca, 26 Oct 73, suelo muy arenoso [very sandy soil], *Valdés-Reyna* VR-446 (RELC). **Jiménez:** Sta Eulalia Mts., C.G. Pringle 414 (US); E. Wilkinson s.n. (US); 31 mi SW of Jimenez, 16 Sep 1939, C.H. Muller 3329 (US).

46. *Bouteloua chihuahuana* (M. C. Johnston) Columbus, Aliso 14(3): 227. 1996. *Bouteloua rigidiseta* (Steud.) Hitchc. var. *chihuahuana* M. C. Johnston, Southw. Naturalist 27: 29. 1982.

Perennial. Culms 40–50 cm tall, slender, weak, in small mats. Sheaths glabrous to slightly scabrous; ligule 0.5 mm long, a ciliate ring; blades 6–17 cm long, 1–2 mm wide, involute, apiculate, glabrous to scaberulous, especially over the margins,

occasionally with sparse pubescence adaxially. Inflorescence 3–6 cm long, bearing 2–8 spikes of 0.8–1.6 mm long including the awns, erect or ascending, deciduous at maturity, rachis glabrous, bearing 2–5 spikelets; rachis flaccid, never bifurcate or trifurcate at the apex. Spikelets 5–7 mm long, permanently inserted into the spikes; glumes unequal, lower glumes 3–4 mm long, very narrow, acuminate, sparsely pubescent at the base to glabrous, upper glumes 6–8 mm long, acuminate, scabrous-ciliate on the main vein to the base; lemma 5–7 mm long including the awns, sparsely pubescent on the veins; paleas of equal size, as long as the lemma body, glabrous; anthers 2.5–3 mm long, white-yellowish; rudimentary florets 1 to 2, lemma of the rudimentary floret 7–9 mm long, reduced to 3 awns flattened, strong, scabrous, exceeding the awns of the fertile lemma, alternate with intermediate awned lobes; second rudimentary floret similar to the first but smaller.

**DISTRIBUTION AND HABITAT.** *Bouteloua chihuahuana* is endemic to Chihuahua and grows in desert scrublands at 1,500 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Camargo:** Northern end of Sierra de Las Pampas, 11.5 km NW of Las Pampas on road to Cd. Camargo, M.C. Johnston & F. Chiang 8811 (MEXU); **Allred** 5820 (ANSM) Sierra de las Pampas, near Cd. Camargo, K.W. Allred, T. Columbus & Valdés-Reyna 5820 (ANSM, RSA); Sierra de las Pampas, 11.5 km of Las Pampas, on road to Cd. Camargo, T. Columbus 2289 (RSA).

47. *Bouteloua chondrosioides* (Kunth) Benth. ex S. Watson, Proc. Amer. Acad. Arts 18: 179. 1883. *Dinebra chondrosioides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 173, t. 53. 1815. Perennial; caespitose, without rhizomes or stolons. Culms (10)30–60 cm tall, erect, unbranched. Leaves mostly basal; sheaths mostly glabrous, margins often long-ciliate distally; ligules 0.3–0.6 mm long, of hairs; blades 1–10 cm long, 1–2.5(3) mm wide, flat, glaucous, bases with papillose-based hairs on the margins, similar hairs sometimes present on either or both surfaces. Panicles 2.5–6 cm long, with 3–8(10) branches; branches (8)10–15 mm long, densely pubescent, with 8–12 spikelets, axes extending to 5 mm beyond the base of the terminal spikelets, apex entire; disarticulation at the base of the branches. Spikelets appressed, all alike, 7–7.5 mm long, with 1 bisexual and 1 rudimentary floret; glumes evidently hairy; lower glumes 2.5–4.5 mm long; upper glumes 4.5–6.5 mm long; lowest lemmas 4.7–6.2 mm long, hairy distally, 3-lobed, lobes unawned or shortly awned; lowest paleas 5–7.2 mm long, pubescent along the veins and on the margins, bifid, veins excurrent as short awns; anthers 2.8–4 mm long, yellow; upper florets rudimentary, glabrous, 3-awned, awns scabrous, sometimes arising from a short but evident awn column, central awns sometimes with a membranous margin, awns scabrous. Caryopsis about 2.5 mm long, about 0.9 mm wide.  $2n = 20, 22, 40$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua chondrosioides* grows on dry, rocky slopes and grassy plateaus at 200–2,500 m. Its range extends from southern Arizona and

western Texas to Costa Rica. It resembles *B. eludens* in having pubescent panicle branches, but *B. eludens* usually has 12–16 branches 5–11 mm long with 2–6 spikelets whereas *B. chondrosioides* usually has 3–8 branches 10–15 mm long with 8–12 spikelets per branch.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 24.9 km SE of Balleza and 22.5 km N of hwy 24, W of Parral, 26 Sep 1988, grassland, 1900 m, P.M. Peterson & Annable 5955 (ENCB, US); 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10731 (CIIDIR, US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, pinyon-oak communities, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10716 (CIIDIR, US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20029, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Bocoyna:** 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5864 (US). **Buenaventura:** 6 mi E of San Buenaventura, 2 Sep 1958, Reeder & C. Reeder 3197 (US); **Casas Grandes:** At first mt range SE Nuevo Casas Grandes, ca 12 mi SE of town on Hwy to Buenaventura, 30 Aug 1986, Spellenberg & R. Corral 8581 (NMC). **Chihuahua:** 87.7 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, 1620 m, P.M. Peterson, Annable & Y. Herrera 8107 (US); 25 km W of Chihuahua, 20 Aug 1939, L. H. Harvey 1541 (US); 12 mi N of Chihuahua, 16 Sep 1960, grassland, 1554 m, Reeder, C. Reeder & Soderstrom 3480, 3481 (ARIZ, US); near Chihuahua, 21 Aug 1885, C.G. Pringle 410 (US); 25 km W of Chihuahua, 20 Aug 1939, 1615 m, L. H. Harvey 1541 (US); Rancho Experimental La Campana, 15 Oct 1981, pastizal [pastureland], 1500 m, G. Melgoza s.n. (CIIDIR); 87 km N Chihuahua 1 km S Arco Iris on Hwy 45, 5 Oct 1986, Spellenberg, Soreng & R. Corral 8904 (NMC); La Campana, potrero [paddock] La Sierra, 1 km Ote. [W], carr. [hwy] Panamericana, 11 Aug 1976, pastizal, 1500 m, Valdés-Reyna VR-58 (RELC); km 1773 carr. a Juárez, 15 Sep 55, pastizal con encinos [pastureland with oaks], 1500 m, Hern.-Xol. & V. Mathus N-1829 (RELC). **Hidalgo del Parral:** Just S of Parral, 2 Oct 1959, Soderstrom 829 (US); NE edge of Parral, 30 Sep 1959, Correll 22666 (US); 3 mi E of Parral, 13 Sep 1960, Reeder, C. Reeder & Soderstrom 3456 (ARIZ-4839, US); About 8 mi S of Parral, 7 Oct 1966, Reeder & C. Reeder 4620 (ARIZ, US); About 10 mi W of Parral, on road to El Vergel, 7 Oct 1966, Reeder & C. Reeder 4621-Bis (ARIZ); 4609 (US). **Janos:** 2 km W of Carretas, 21 Aug 1939, L. H. Harvey 1562 (US); **Jiménez:** Sta Eulalia plains, 17 Sep 1885, Wilkinson 53 (US); Sta Eulalia pass between Velandena and Cristomines, 29 Aug 1948, W. Hewitt 350 (US). **Matamoros:** 7 mi S of Villa Matamoros, 8 Oct 1966, Reeder & C. Reeder 4622 (ARIZ, US); 19.3 km S of Villa Matamoros on Mex 45 to Durango, 3 Oct 1989, 1910 m, P.M. Peterson & R.M. King 8262 (US). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, P.M. Peterson & Annable 5768 (US).



48. *Bouteloua curtispindula* (Michx.) Torr., Explor. Red River Louisiana 300. 1853. *Chloris curtispindula* Michx., Fl. Bor.-Amer. 1: 59. 1803.

Panicles 13–30 cm long, secund, with (12)30–80 reflexed branches; branches (5)10–30(40) mm long, deciduous, with (1)2–7(15) spikelets, axes terminating 3–5 mm beyond the base of the terminal spikelets, apex entire; disarticulation at the base of the branches. Spikelets 6–8 mm long, appressed, all alike, with 1 bisexual floret and 1–2 sterile, rudimentary florets; glumes unequal, glabrous or scabrous; lower glumes 2.5–6 mm long, ½ or more as long as the upper glumes; upper glumes 5.5–8 mm; lowest lemmas 3–6.5 mm long, glabrous or scabrous-strigose, often minutely rugose, acute or inconspicuously 3-lobed, 3-veined,

veins usually excurrent as short mucros or awns to 6 mm; central mucros or awns not flanked by membranous lobes; lowest paleas acute, unawned; anthers 1.5–3.5 mm long, yellow, orange, red, or purple; distal floret(s) 0.4–3.5 mm long, sterile, variable, usually a glabrous lemma having a short membranous base, no palea, and 3 unequally developed awns, central awns 1.5–7 mm.  $2n = (20), 40, 41-103$ .

*Bouteloua curtispindula* is a common, often dominant or co-dominant species in open grasslands and wetlands of the drier portions of the central grasslands of North America. It is highly regarded as a forage species and is also an attractive ornamental. Its range extends from United States, Mexico, and Central America to western South America.

#### KEY TO VARIETIES OF *BOUTELOUA CURTISPINDULA*

1. Plants forming small mats, with rhizomes or stolons.
  2. Rhizomatous plants, lacking stolons; culms erect and stiff; blades 5–7(8) mm wide, flat, green-bluish, with pubescence of papillose base; inflorescence with 40–70 spikelets; spikelets typically purple; anthers red or orange-reddish . . . . . *B. curtispindula* var. *curtispindula*
  2. Stoloniferous plants or the culms slender and decumbent, with inferior nodes rooted, rhizomes missing; blades 2–4 mm wide, relatively large and slender, inrolled at the base; inflorescence bearing 4–9 spikes; spikelets stramineous to light brown; anthers yellow or orange . . . . . *B. curtispindula* var. *tenuis*
1. Plants generally forming large mats, lacking stolons or rhizomes; culms erect; blades 3–5 mm wide, thick and stiff; inflorescence with 30–80 spikes; spikelets plumbeous, stramineous, or green colored with purple spots; anthers yellowish or orange . . . . . *B. curtispindula* var. *caespitosa*

*Bouteloua curtispindula* var. *caespitosa* Gould & Kapadia, Brittonia 16(2): 203, f. 43. 1964.

FIGURE 43

**DISTRIBUTION AND HABITAT.** *Bouteloua curtispindula* var. *caespitosa* grows in grasslands, xerophyll scrubs, oak and pine forests, and tropical deciduous forests at 1,500–2,450 m. It ranges from United States and Mexico to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** NE of Aldama along Chihuahua hwy 16, 14 Sep 1972, 1360 m, J. Henrickson 7514 (US); Aldama, Sitio 27, Torreño # 3, 2 Sep 2015, 29°04'45"N, 105°45'49"W [29.07917°N, 105.76361°W], matorral subinerme [mostly unarmed scrub] con *Fouquieria splendens*, *Tecoma stans*, *Acacia neovernicosa* & *Cassia wislizenii*, 1380 m, J. Santos & A. Olivas 528 (CIIDIR, UACH). **Allende:** 20 mi N from Parral to Jiménez on hwy 45, 21 Jul 2006, grassland, 1750 m, K.R. Adams & N. Martínez 059-2006 (CIIDIR). **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10725 (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 206 (US). **Buenaventura:** km 11 San Buenaventura–El Carmen, 23 Oct 1954, Hern.-Xol. & Tapia N-152 (US). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, L. H. Harvey 1384 (US); Sitio 17, Rancho Epigmenia, 25 Aug 2015, 27°46'37.7"N, 104°09'10.8"W [27.62833°N, 104.15306°W],

matorral desértico [desert scrub] con *Yucca carnerosana*, 1627 m, J. Santos & A. Olivas s.n. (CIIDIR, UACH). **Casas Grandes:** Col. Juarez, Sierra Madre Occidental, 21 Sep 1934, Pennell 19054 (US). **Chihuahua:** near Chihuahua, 3 Sep 1935, LeSueur Mex-024 (US); Hitchcock 7797 (US); hills and plains near Chihuahua, 27 Aug 1885, C.G. Pringle 408 (US); vicinity of Chihuahua, 27 Apr 1908, E. Palmer 114 (US); km 1773 carr. [hwy] Juárez, 15 Sep 55, pastizal [pastureland], Hern.-Xol. & V. Mathus N-1833 (US); 6.1 mi W of hwy 45 on dirt road towards Santa Clara, 18 Oct 1992, bosque de encino [oak forest], 1640 m, P.M. Peterson & Annable 12582 (US); Rancho La Campana, potreros del lado W [paddocks on W side], km 80 autopista Chihuahua–Cd. Juárez, 25 Nov 1994, pastizal natural, 1590 m, Y. Herrera & M.E. Siqueiros 1343 (CIIDIR). **Cuahuatémoc:** 9.7 kms al N del entronque [junction] de carrs. 28 & 16, 10 Aug 1976, vegetación riparia [riparian vegetation], J.M. Peña JMP-140 (RELC). **General Trías:** km 43 Cd. Chihuahua–Cd. Cuahuatémoc, 27 Oct 54, pastizal, 1600 m, Hern.-Xol. & C. Tapia N-304 (RELC). **Guerrero:** Miñaca, 13 Oct 1910, Hitchc. 7739 (US). **Janos:** San Luis Mts, Mexican boundary line, 19 Jul 1892, E.A. Mearns 520 (US); Chihuahua–Sonora Border, Rancho Carretas, 29 Aug 1939, 1460 m, L. H. Harvey 1611 (US). **Jiménez:** Sta Eulalia plains, 15 Sep 1885, E. Wilkinson 64 (US); Sta Eulalia pass between Velandena and Cristomines, 29 Aug 1948, W. Hewitt 349 (US); El Hugo, Torreoncitos, 13 Aug 2010, matorral de *Prosopis* sp., 1355 m, D. Ramírez & M.L. Juárez 3395 (CIIDIR). **Juárez:** S of Samalayuca, autopista Chih.–Cd. Juarez,

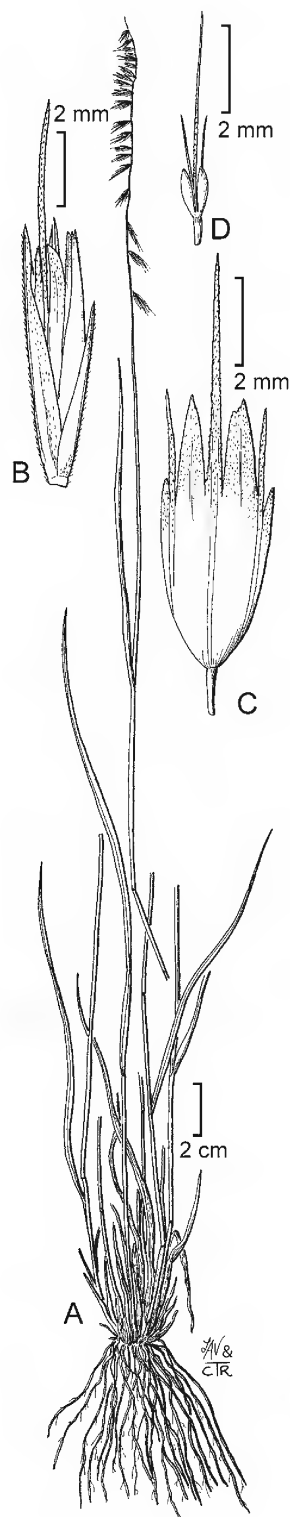


FIGURE 43. *Bouteloua curtipendula* var. *caespitosa*. A. Habit. B. Spikelet. C. Fertile lower lemma. D. Sterile upper lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

9 Oct 1997, M.E. Siqueiros 4475 (US); parte alta de la Sierra de Samalayuca, 50 km al S de Cd. Juárez, 9 Sep 1995, 1300 m, R. Corral & P. Olivas RCD6365 (UACJ); Sierra de Samalayuca, 13 Oct 1997, pastizal, I. Enríquez, S. Ordoñez & J. Leyva IEA17 (UACJ); Sierra del Presidio, área de Samalayuca, 1 Sep 1999, pastizal, I. Enríquez & P. Olivas IE050 (UACJ); km 5 desviación [deviation] a Nvo. Casas Grandes de la carr. a Juárez, 19 Sep 55, pastizal, 1600 m, Hern.-Xol. & V. Mathus N-1912 (RELC, US); camino a Presidio, 2 km de la carr. Panamericana, 24 Oct 74, matorral micrófilo [microphytic scrub], 1400 m, Valdés-Reyna VR-766 (RELC). **Madera:** El agua caliente [hot water], predio particular [private property] El Chorrillo, 17 Oct 1990, bosque de encino, 2350 m, A. Benítez 2924 (CIIDIR). **Ocampo:** Parque Nacional "Cascada de Basaseachic," in a canyon along Río Basaseachi leading to falls, 4 Oct 1986, 1800 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8820 (NMC), **Temosachi:** Nobogame, 8 Sep 1987, 1800 m, Reeder, C. Reeder & Laferr. 1046 (NMC).

*Bouteloua curtipendula* (Michx.) Torr. var. *curtipendula*.

#### FIGURE 44

**DISTRIBUTION AND HABITAT.** *Bouteloua curtipendula* var. *curtipendula* grows in grasslands, scrub communities, and *Taxodium* gallery at 1,750–2,300 m. It ranges from Canada and the United States to Mexico in Chihuahua, Coahuila, Distrito Federal, Nuevo León, Puebla, and Tamaulipas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5367 (UACJ); 32 km SW de Villa Ahumada, cerca [near] del rancho Santo Domingo rumbo [course] a Casas Grandes, 22 Oct 54, 1100 m, Hern.-Xol. & C. Tapia N-91 (RELC). **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20016, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Chihuahua:** Rancho Experimental La Campana, 16 Oct 1980, pastizal [pastureland], 1640 m, A. Melgoza 647 (CIIDIR); La Campana; 1 km Pte. carr. [hwy] Panamericana, 18 Sep 73, pastizal mediano abierto [mostly open grassland], 1500 m, Valdés-Reyna VR-309, VR-97 (RELC); km 1319 carr. Juárez, 12 Sep 55, pastizal, 1900 m, Hern.-Xol. N-1726 (RELC). **Guachochi:** Río Osichi Canyon at jct of Río Basihuare, up Río Osichi Canyon, 31 Aug 2003, bosque de encino [oak forest], 1650 m, P.M. Peterson & P. Catalán 17625 (CIIDIR, US). **Madera:** Paraje Sirupa, ejido Cebolitas, 16 Oct 1990, bosque de encino, 1200 m, O. Bravo 1926 (CIIDIR).

*Bouteloua curtipendula* var. *tenuis* Gould & Kapadia, Brittonia 16(2): 201, f. 42. 1964.

**DISTRIBUTION AND HABITAT.** *Bouteloua curtipendula* var. *tenuis* grows in grasslands and scrub of *Larrea tridentata* at 1,980–2,500 m. In Mexico it occurs in Aguascalientes, Chiapas, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Jalisco, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta et al. (2004).

49. *Bouteloua dactyloides* (Nutt.) Columbus, Aliso 18(1): 63. 1999. *Sesleria dactyloides* Nutt., Gen. N. Amer. Pl. 1: 65. 1818. *Buchloë dactyloides* (Nutt.) Engelm., Trans. Acad. Sci. St. Louis 1: 432, pl. 12 & 14, f. 1–17. 1859. *Bulbilis dactyloides* (Nutt.) Raf. ex Kuntze, Revis. Gen. Pl. 2: 763. 1891.

Perennial; usually dioecious; strongly stoloniferous, sometimes mat-forming. Culms 1–30 cm tall, erect, solid, mostly unbranched, those of the pistillate inflorescences much shorter than those of the staminate inflorescences; nodes mostly glabrous. Leaves basally tufted, not clustered or strongly distichous; sheaths open, rounded, often sparsely pilose near the collar; ligules membranous or of hairs; blades usually flat basally, curling when dry, glabrous or sparsely pilose, apex involute. Staminate inflorescences terminal, usually exceeding the upper leaves, panicles of 1–3(4) racemously arranged, unilateral, pectinate branches; branches not enclosed at maturity, spikelets densely crowded in 2 rows. Staminate spikelets with 2 florets; glumes unequal, glabrous, 1- or 2-veined; lemmas 3-veined, glabrous, unawned; anthers brownish to red or orange. Pistillate inflorescences terminal, panicles, partially hidden within bracteate sheaths; branches 2–3(4), 2.5–4.5 mm long, bur-like, with 3–5(7) spikelets; disarticulation at the base of the panicle branches. Pistillate spikelets with 1 floret, almost completely enclosed by the upper glumes; lower glumes irregular and reduced; branch axes and lower portion of upper glumes globose, white, indurate, terminating in 3 awn-like teeth; lemmas firmly membranous, glabrous, 3-veined, unawned or shortly 3-awned.  $2n = 20, 40, 56, 60$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua dactyloides* is a common grass in the central plains of North America. It is usually dioecious, infrequently monoecious, and rarely synoecious.

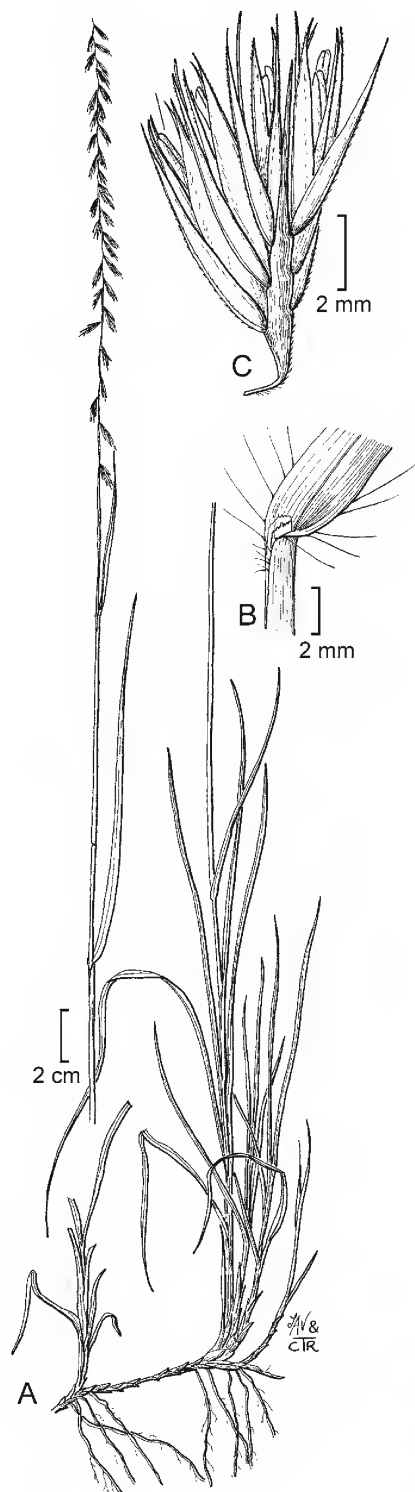


FIGURE 44. *Bouteloua curtipendula* var. *curtipendula*. A. Habit. B. Ligule. C. Inflorescence branch. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Alende:** Pueblito, orilla de una laguna [shore of lagoon], 23 Jul 1988, *P.L. Mata Fierro s/n* (MEXU). **Chihuahua:** Rancho experimental La Campana, 16 Oct 1980, pastizal [pastureland], 1500 m, *A. Melgoza 619* (CIIDIR); La Campana, Potrero del Plan, 1 km al SE carr. [hwy] Panamericana, 11 Sep 73, pastizal, 1500 m, *Valdés-Reyna VR-207* (RELC). **Cuauhtémoc:** 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable 9588* (US). **Cusihuiriáchi:** Laguna Grande, 10 Aug 1975, vegetación riparia [riparian vegetation], 1950 m, *J.M. Peña JMP-135* (RELC); Laguna Mexicanos, 29 Aug 1977, 2030 m, *Blanco-Gómez 05777* (MEXU). **Jiménez:** 10 km E of Cd. Jiménez, 31 Jul 1939, *L. H. Harvey 1346* (US); About 2 mi SW of Jiménez, 6 Oct 1966, *Reeder & C. Reeder 4606* (ARIZ, US). **Temosachi:** about 25 mi S of Natachic, in a depression in grassland, 9 Jul 1950, *Reeder, C. Reeder & Goodding 1243* (ARIZ, ENCB, MEXU).

**50. *Bouteloua diversispicula*** Columbus, *Aliso* 18(1): 63. 1999. *Cathestecum brevifolium* Swallen., *J. Wash. Acad. Sci.* 27(12): 500. 1937.

Perennial; polygamous or dioecious; caespitose, forming dense, small clumps, stoloniferous, stolons thin, internodes to 10(12) cm long, straight or only slightly arching. Culms 5–15 cm tall, erect or geniculate. Leaves primarily basal; lower sheaths densely villous basally, mostly glabrous or sparsely pilose distally, throats densely ciliate; blades 1–5 cm long, 1–2 mm wide, stiff, flat to involute, abaxial surfaces glabrous, adaxial surfaces scabrous and pilose, margins scabrous. Panicles with 3–10 branches; branches divergent, dimorphic, with staminate or bisexual spikelets, spikelets usually reddish or purple. Staminate branches with all spikelets similar; lower glumes to 1 mm long, often reduced to a scale, 0- to 1-veined; upper glumes  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the spikelets, narrowly lanceolate, usually glabrous, veins sometimes sparsely pilose, glumes of the lateral spikelets about 2.5 mm long, acute or acuminate, those of the central spikelets about 3 mm long, minutely lobed and mucronate; lowest lemmas to 3 mm long, sparsely pilose, with short lobes, mucronate between the lobes; distal lemmas to 2.5 mm long, similar to the lowest lemmas but with deeper lobes; anthers 0.7–2 mm. Bisexual branches: lateral spikelets poorly developed, lower glumes to 1 mm long, upper glumes to 2.5 mm long, veins pilose, florets greatly reduced, sometimes just a cluster of awns, sterile (rarely staminate); central spikelets with glumes similar to those of the lateral spikelets; lowest florets pistillate, lemmas about 3 mm long, scabrous, lobed, lobes about  $\frac{1}{4}$  as long as the lemmas, awned from the sinuses, awns slightly exceeding the lobes; distal florets staminate or sterile, about 2.5 mm long, deeply lobed, awned from the sinuses, awns exceeding the lobes by 1–3 mm.  $2n = 20, 40, 60$ , and 80.

**DISTRIBUTION AND HABITAT.** *Bouteloua diversispicula* extends from Arizona, to Mexico, El Salvador, and Honduras.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer 66* (US). **Ojinaga:**

Ca. 9 km of Ojinaga on the Hwy to Chihuahua City, 20 Oct 1972, matorral desertico [desert scrub] 820 m, *F. Chiang, T. Wendt & M.C. Johnston 9723* (MEXU).

**51. *Bouteloua eludens*** Griffiths, *Contr. U.S. Natl. Herb.* 14(3): 401, pl. 78–80a. 1912.

FIGURE 45

Perennial; without rhizomes or stolons. Culms 20–60 cm tall, unbranched. Leaves mostly basal; sheaths glabrous or sparsely ciliate near the throat, basal sheaths papery, becoming pale; ligules to 0.5 mm long, of hairs; blades to 15 cm long, 1–1.5(3) mm wide, flat, lower leaves variously hirsute or scabrous, upper leaves glabrous, with scabrous margins. Panicles 6–10 cm long, with (8)12–16(20) branches; branches 5–11 mm long, deciduous, pubescent, with (2)4–6 spikelets, axes extending about 5 mm beyond the terminal spikelets, apex entire; disarticulation at the base of the branches. Spikelets appressed, all alike, with 1–2 bisexual florets and 1 rudimentary floret; glumes silvery-hirsute over and between the veins, at least basally, apex acute, acuminate, or shortly awned; lower glumes 5–6 mm long; upper glumes 6–7 mm long, sericeous over the veins and elsewhere, hairs about 0.5 mm long, apex mucronate; lowest florets bisexual, pistillate, or staminate; lowest lemmas 6–7 mm long, pubescent between the veins and over the midveins, midveins excurrent into acuminate or setaceous lobes about the same length as the lateral lobes, not flanked by membranous lobes, lateral veins excurrent from the lateral lobes for 0.5–2 mm; lowest paleas as long as the lemmas, pubescent, acute to acuminate, unawned; second florets usually staminate, pistillate, or bisexual (rarely rudimentary); second lemmas 8–10 mm long; usually well-developed, pubescent, lateral veins extended into 0.5–4 mm awns, midveins extended into a flattened awn 1–5 mm long; second paleas as long as the second lemmas, pubescent, usually with 2 short awns; third florets, if present, pubescent, variable, resembling the second floret, a 3-awned structure with 2 membranous scales, or a prolongation of the rachilla. Caryopsis about 5 mm long, about 1.5 mm wide.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua eludens* grows on dry, rocky slopes and rolling desert flats at 1200–1800 m. It is known from Cochise, Santa Cruz, and eastern Pima counties in Arizona, adjacent portions of New Mexico, and to Chihuahua and Sonora, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Beetle, (1977), Espejo Serna et al. (2000), and Herrera Arrieta and Cortés Ortiz (2010).

**52. *Bouteloua erecta*** (Vasey & Hack.) Columbus, *Aliso* 18(1): 63. 1999. *Cathestecum erectum* Vasey & Hack., *Bull. Torrey Bot. Club* 11: 37. 1884.

Perennial; polygamous; caespitose, forming dense, small clumps, stoloniferous, stolons thin, internodes 15–40 cm long, strongly arching. Culms 10–30 cm tall, erect or geniculate, glabrous. Leaves primarily basal; lower sheaths overlapping,

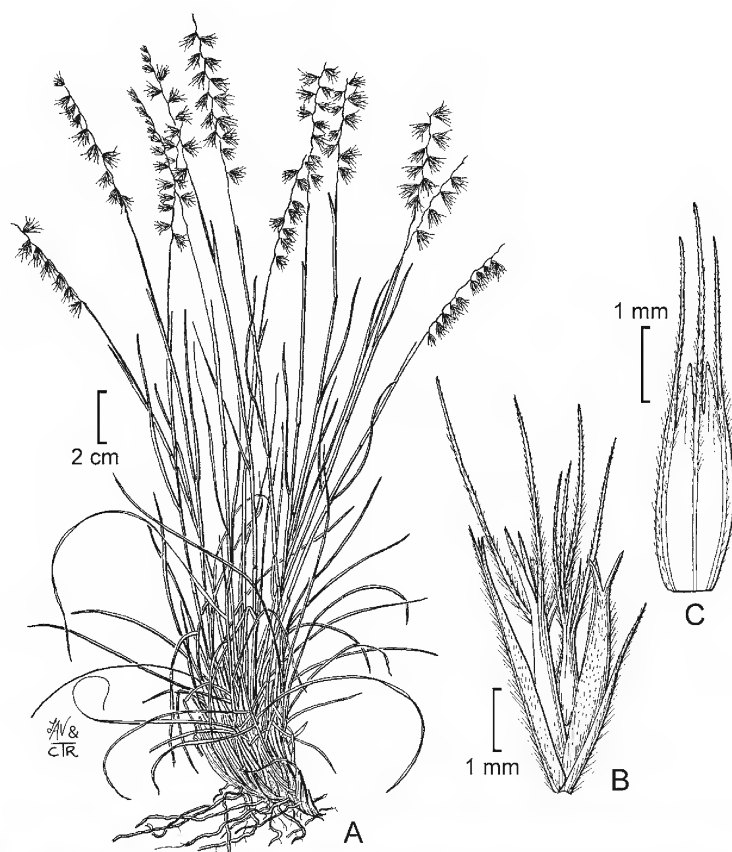


FIGURE 45. *Bouteloua eludens*. A. Habit. B. Spikelet. C. Fertile lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

densely villous basally, throats pilose; upper sheaths not overlapping, glabrous; ligules about 0.3 mm long; blades 3–12 cm long, 1–1.5 mm wide, involute or flat, glabrous abaxially, scabrous and sparsely pilose adaxially, hairs to 2 mm. Panicles with 5–7 branches; branches about 5 mm long, dimorphic, staminate or bisexual, the 2 forms sometimes on different plants, sometimes mixed within a panicle, spikelets of 1 form all staminate, bisexual form with pistillate (sometimes bisexual) central spikelets and well-developed staminate or sterile lateral spikelets, spikelets frequently pale green. Staminate branches: all spikelets similar; lower glumes about 1 mm; upper glumes glabrous or almost so, those of the lateral spikelets about 3 mm long, those of the central spikelets about 4 mm; lemmas similar, about 3 mm long, glabrous, irregularly lobed, unawned, sometimes mucronate. Bisexual branches: glumes villous; lateral spikelets with staminate or sterile florets; lemmas of lateral spikelets about 3 mm long, glabrous or sparsely pubescent, irregularly lobed, awned from the sinuses, awns hispid, equaling or occasionally exceeding the lobes; anthers 1.7–2.3 mm long; central spikelets with the lowest

floret pistillate, distal florets staminate or sterile; lowest lemmas glabrous or sparsely pubescent, lobed, lobes about  $\frac{1}{3}$  as long as the lemmas, awned from the sinuses, awns glabrous, subequal to the lobes or the central awns slightly longer; distal florets similar to those of the lateral florets, awns 1–2 mm longer than the lobes.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua erecta* grows on dry hills in the Great Bend region of western Texas and in northern Mexico. It ranges from United States and northern Mexico to Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Creel, along airstrip southeast of Creel, 16 Jul 1972, grass in dry part of field, 7240 ft, *Bye 2344* (MEXU). **Guachochi:** 16.4 km SW of La Bufa and 6.4 km NE of Batopilas, 710 m, *P.M. Peterson, Annable & Valdés-Reyna 10852* (US). **Ojinaga:** 10 mi S of Ojinaga, road from Ojinaga south to Alamos Chabo, 9,10 Aug 1941, ravine in low hills, *I.M. Johnston 8018* (MEXU); 17.5 km S of Ojinaga on Chih. Hwy 18, 21 Oct 1990, 1100 m, *Spellenberg, M. Mabrt & L. Rayburn 10741* (MEXU).



53. *Bouteloua eriopoda* (Torr.) Torr., Pacif. Railr. Rep. 4(5): 155. 1856. *Chondrosum eriopodum* Torr., Not. Milit. Recon. 154. 1848.

FIGURE 46

Perennial; often short rhizomatous, stoloniferous, stolons long, densely woolly pubescent. Culms 20–60(75) cm long, wiry, decumbent, rooting at the lower nodes; lower internodes densely woolly pubescent. Sheaths mostly glabrous or sparsely pilose, usually pilose near the ligules; ligules 0.1–0.4 mm long, of hairs; blades 2.5–6 cm long, 0.5–2 mm wide, scabrous adaxially, margins with papillose-based hairs basally. Panicles (1)2–16 cm long, with (1)2–8 branches; branches 14–50 mm long, persistent, densely woolly pubescent basally, with 8–18 spikelets, axes terminating in entire, sometimes scarious apex; disarticulation above the glumes. Spikelets pectinate, with 1 bisexual floret and 1 rudimentary floret; glumes unequal, smooth or scabrous; lower glumes 2–4.5 mm; upper glumes 4.5–8(9) mm long, glabrous, scabrous, or with hairs, hairs to 0.5 mm long, not papillose-based; lower lemmas 4–7 mm long, pubescent basally, glabrous or sparsely puberulent distally, acuminate, central awns 0.5–4 mm long, lateral awns absent or shorter than 1 mm long; lower paleas acuminate, unawned; anthers 1.5–3 mm long, yellow to orange; rachilla segment to second florets about 2 mm

long, with a distal tuft of hairs; upper florets rudimentary, an awn column terminating in 3 awns, the awns 4–9 mm long. Caryopsis 2.5–3 mm long.  $2n = 20, 21, 28$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua eriopoda* grows on dry plains, foothills, and open forested slopes, often in desert shrublands, and also in waste ground. It is usually found between 1,000–1,800 m but extends to 2,500 m. Once a dominant in much of its range, under heavy grazing *B. eriopoda* persists only where protected by shrubs or cacti because it is highly palatable. Its range extends from the southwestern United States to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 2 mi N of Gallego, 16 Sep 1960, *Reeder & C. Reeder & Soderstrom* 3492 (ARIZ, US); Villa Ahumada flats, 10–20 Oct 1935, *LeSueur Mex-066* (US). **Camargo:** 6 mi W of Piloncillo, rd from Jimenez to Camargo, 23–24 Sep 1938, *I.M. Johnston* 7875 (US); 16 mi SE of Camargo, 3 Sep 1967, *Reeder & C. Reeder* 4842 (ARIZ); E Chihuahua, 4.5 mi NW of San Francisco, rd from Jaco to Mesteñas (via Honorato, Victoria & San Francisco), 5 Oct 1941, *R. Stewart & I.M. Johnston* 2012 (US); rd from Camargo NE of Mesteñas, 40 mi NE of Camargo, 25 Sep 1938, *I.M. Johnston* 7937 (US); 2 mi S of Rancho San Fernando, 40 mi NE of Camargo, 25 Sep 1938, *F. Shreve* 8896 (US); Rancho Mesteñas, 20 km S La Perla, 20 Oct 1996, 1450 m, *C. Yen & E. Estrada* 6821 (NMC). **Chihuahua:** Chihuahua, 14 Oct 1910, *Hitchcock* 7794 (US); Hills and plains near Chihuahua, 31 Aug 1885, *C.G. Pringle* 411 (US); Rancho La Presa, 21 Oct 1954, 1100 m, *Hern.-Xol. & C. Tapia* N-62 (US); Rancho Experimental La Campana, 16 Oct 1980, pastizal [pastureland], 1500 m, *A. Melgoza* 649 (CIIDIR); Rancho La Campana, potreros del lado W [paddocks on W side], km 80 autopista Chihuahua–Cd. Juárez, 25 Nov 1994, pastizal natural, 1590 m, *Y. Herrera & M.E. Siqueiros* 1340 (CIIDIR); 35 km norte de Chih., carr. [hwy] Chih.–Cd. Juárez, 24 Oct 1997, 1400 m, *C. Yen & E. Estrada* 9031 (NMC); La Campana, Potrero La Sierra, 1 km Pte., carr. Panamericana, 31 Aug 1975, pastizal, 1500 m, *Valdés-Reyna* VR-53 (RELC); *L. Suárez & M. Valencia* s/n (RELC). **Jiménez:** Sierra de los Organos, 8 Sep 1937, *LeSueur* 0162 (US); About 5 mi SW of Jiménez, 6 Oct 1966, *Reeder & C. Reeder* 4608 (ARIZ). **Juárez:** km 5 desviación [deviation] a Nvo. Casas Grandes de la carr. a Juárez, 19 Sep 1955, pastizal, 1600 m, *Hern.-Xol. & V. Mathus* N-1922 (US); km 16 al S de Cd. Juárez, carr. Juárez–Cd. Chihuahua, 20 Oct 1954, *Hern.-Xol. & C. Tapia* N-2 (US); Sierra de Samalayuca, 13 Oct 1997, pastizal, *I. Enríquez, S. Ordoñez & J. Leyva* IEA18 (UACJ); parte S de la Sierra de Samalayuca, aprox. 50 km al S de Cd. Juárez, 9 Sep 1995, 1300 m, *R. Corral & P. Olivas* RCD6364 (UACJ); 3 mi S of Samalayuca, 4 Nov 1957, 1300 m, 31.3, 106.5, *R.V. Moran* s.n. (ARIZ). **Manuel Benavides:** 1 mi E of Pozo de Villa, along rd from Ojinaga to Castillon, vía La Mula, Trincheras, Pirámide and San Salvador, 10 Aug 1941, *I.M. Johnston* 8176 (US). **Ojinaga:** E Chihuahua, Sierra del Virulento, 2–3 mi E of Rancho Virulento, about 65 mi S of Ojinaga, 11 Aug 1941, *I.M. Johnston* 8085 (US).

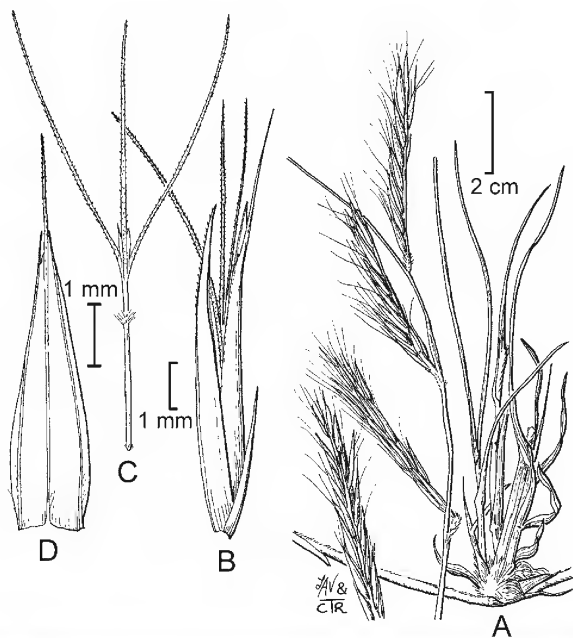


FIGURE 46. *Bouteloua eriopoda*. A. Habit. B. Spikelet. C. Upper floret. D. Lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

54. *Bouteloua gracilis* (Kunth) Lag. ex Griffiths, Contr. U.S. Natl. Herb. 14: 375. 1912. *Chondrosum gracile* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 176. t. 58. 1815.

FIGURE 47

Perennial; usually densely caespitose, often with short, stout rhizomes. Culms 24–70 cm tall, not woody basally, erect, geniculate, or decumbent and rooting at the lower nodes, not branched from the aerial nodes; nodes usually 2–3, glabrous or puberulent; lower internodes glabrous. Leaves mainly basal; sheaths glabrous or sparsely hirsute; ligules 0.1–0.4 mm long, of hairs, often with marginal tufts of long hairs; blades 2–12(19) cm long, 0.5–2.5 mm wide, flat to involute at maturity, hairs usually present basally. Panicles 0.5(12.5) cm long with 1–3(6) branches, these racemously inserted on the rachis; branches 13–50(75) mm long, persistent, arcuate, scabrous, without papillose-based hairs, with 40–130 spikelets, terminating in a spikelet; disarticulation above the glumes. Spikelets pectinate, with 1 bisexual and 1 rudimentary floret; glumes mostly glabrous or scabrous, midveins sometimes with papillose-based hairs; lower glumes 1.5–3.5 mm; upper glumes 3.5–6 mm; lowest lemmas 3.5–6 mm long, pubescent at least basally, 5-lobed, central and lateral lobes veined and awned, awns 1–3 mm long, central awns flanked by 2 membranous lobes; lower paleas about 5 mm long, shallowly bilobed, veins excurrent for less than 1 mm; rachilla internodes subtending second florets with a distal tuft of hairs; anthers 1.7–2.9 mm long, yellow or purple; upper florets sterile, 0.9–3 mm long, lobed almost to the base, lobes rounded, 3-awned, awns 1–3 mm, equal. Caryopsis 2.5–3 mm long, about 0.5 mm wide.  $2n = 20, 28, 35, 40, 42, 60, 61, 77, 84$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua gracilis* grows in pure stands in mixed prairie associations and disturbed habitats, usually on rocky or clay soils and mainly at elevations of 300–3000 m. Its native range extends from Canada to central Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al Nte.[N] de Sueco, 18 Oct 74, matorral micrófilo [microphytic scrub], 1400 m, *Valdés-Reyna* VR-648 (RELC). **Aldama:** 26 (rd) mi NE of Aldama along Hwy 16 near El Morion, 15 Sep 1972, 1400 m, *J. Henrickson* 7565 (NMC); km 38 Villa Aldama–Hormigas, 31 Oct 54, pastizal [pastureland], 1150 m., *Hern.-Xol. & C. Tapia* N-529 (RELC). **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on MEX 432, near Corral de Duarte, 18 Sep 1991, bosque de pino-encino [pine-oak forest], 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10710 (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 24 (US). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7716 (US). **Camargo:** 6 mi W of Piloncillo, rd from Jimenez to Camargo, 24 Sep 1938, *I.M. Johnston* 7878 (US); Sierra de los Organos, 8 Sep 1937, *LeSueur* 0166 (US). **Carichi:** Mojarachic, 5 Sep 1938, *I.W. Knobloch* 5651 (US). **Casas Grandes:** Near Casas Grandes, 30 Aug 1899, *E.W. Nelson* 6330 (US); Col. Juarez, Sierra Madre Occidental, 21 Sep 1934, *Pennell* 19053 (US); 1.6 mi NE Col. Juarez SW Casas Grandes, 30 Aug 1986, 2000 m, *Spellenberg*

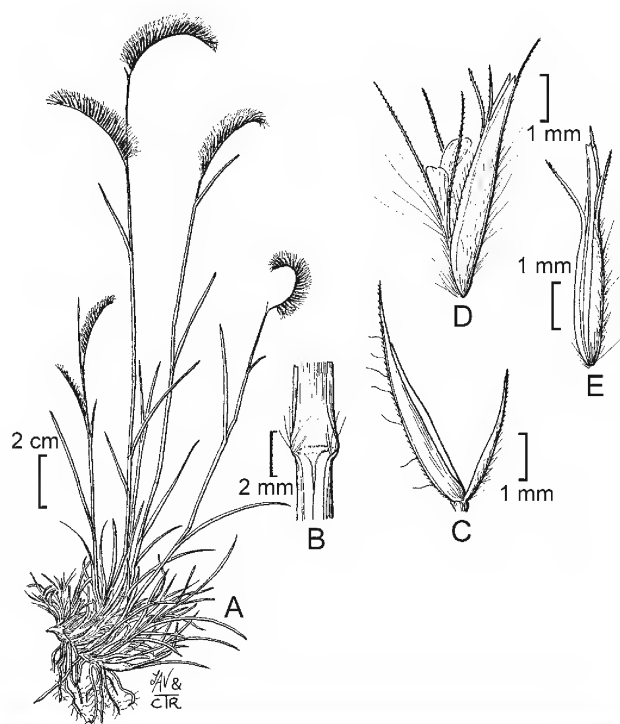


FIGURE 47. *Bouteloua gracilis*. A. Habit. B. Ligule. C. Glumes. D. Florets. E. Lower floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

& *R. Corral* 8585 (NMC). **Chihuahua:** Chihuahua, 14 Oct 1910, *Hitchcock* 7799 (US); hills and plains near Chihuahua, 23 Aug 1885, *C.G. Pringle* 407 (US); 6.1 mi W of hwy 45 on dirt road towards Santa Clara, 18 Oct 1992, bosque de encino, 1640 m, *P.M. Peterson & Annable* 12583 (US); Rancho La Campana, potreros del lado W [paddocks W side], km 80 autopista Chihuahua–Cd. Juárez, 25 Nov 1994, pastizal natural, 1590 m, *Y. Herrera & M.E. Siqueiros* 1342 (CIIDIR); Rancho Experimental La Campana, 16 Oct 1980, pastizal, 1640 m, *A. Melgoza* 626 (CIIDIR); 6 km al S de Chihuahua, carr. [hwy] Chihuahua–Delicias, 17 Aug 1996, *E. Estrada & C. Yen* 5407 (NMC); Rancho Gallego, Estación Sueco, 14 Sep 1999, pastizal, *I. Enríquez & P. Olivas* IE055 (UACJ); La Campana, Potrero El Bajío, 1 km Ote. [W], carr. Panamericana, 13 Sep 73, pastizal, 1500 m, *Valdés-Reyna* VR-241 (RELC). **Cuahutémoc:** 6–7 km al N, entronque [junction] carrs. 28 & 16, 10 Aug 1976, ruderal, 2100 m, *J.M. Peña* JMP-138 (RELC); 21 km W of Cuahutémoc, on Hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable* 9596 (US); 5.6 mi N of Cuahutémoc on Mex 23, 14 Sep 1989, 2120 m, *P.M. Peterson & R.M. King* 8109 (US). **Guadalupe:** NE Chihuahua, vicinity of Rancho El Pino, ca 10 km SE of Sierra Rica, 23 Sep 1942, *R. Stewart* 2408 (US). **Guerrero:**

railroad NW of San Isidro, Sierra Madre Occidental, 18 Sep 1934, *Pennell* 18985 (US); 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable* 5856 (US); Miñaca, 13 Oct 1910, *Hitchcock* 7746 (US); carr. La Junta–San Juanito, 17 km, 22 Sep 1997, bosque de encino, 2290 m, *B. Tab V. 9* (CIIDIR). **Hidalgo del Parral:** NE edge of Parral, 30 Sep 1959, *D.S. Correl* 22660 (ENCB); 10 mi W of Parral on road to El Vergel, 7 Oct 1966, *Reeder & C. Reeder* 4621 (ARIZ); 3 mi E of Parral, 13 Sep 1960, *Reeder & C. Reeder* 3455 (ARIZ-3456, US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 29 Aug 1939, 1460 m, *L. H. Harvey* 1597 (US). **Guerrero:** Barranca Colorada, Sierra Gazachic, 35 km S of Miñaca, 2500 m, *Pennell* 18980 (US). **Gran Morelos:** 4 mi E of General Trias, 14 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3464 (ARIZ, US). **Janos:** Mexican boundary line near White Water, 11 Sep 1893, *E.A. Mearns* 2301 (US). **Jiménez:** Sta Eulalia plains, 15 Sep 1885, *Wilkinson* 63 (US). **Madera:** along railroad N of Madera, Sierra Madre Occidental, 19 Sep 1934, *Pennell* 18998 (US); near Col. Garcia in the Sierra Madre, 15 Aug 1899, *C.H.T. Townsend & C.M. Barber* 257 (US). Proximidad a la col. Chuichupa, 1 Sep 1990, bosque de junípero [juniper grove], 2240 m, *A. Benítez* 2163 (CIIDIR); Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, *Quintana, Lebgue & Estrada* 3305 (NMC). **Manuel Benavides:** E Chihuahua, 2 mi W of Pozo de Villa, along rd from Ojinaga to Castillon, via La Mula, Trincheras, Pirámide and San Salvador, 10 Aug 1941, *I.M. Johnston* 8165 (US). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” near top of falls, 22 Sep 1994, 2000 m, *Spellenberg, Corral & Estrada* 12099 (NMC); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7959 (US). **Práxedes G. Guerrero** (San Ignacio): a 2 km al S del poblado del mismo nombre [town of the same name], Rancho Escuela de la Univ. Autónoma de Cd. Juárez, 18 Mar 1995, 1090 m, *R. Corral, P. Olivas & E. Pérez* RCD6043 (UACJ). **Riva Palacio:** Majalca, 18–20 Aug 1935, *LeSueur Mex-017* (US); **Riva Palacio:**

Majalca (Pilares), 11 Aug 1939, *L. H. Harvey* 1462 (US). Col. Cumbres de Majalca, approx. 32.2 km W of hwy 45 N of Chihuahua, 22 Sep 1988, pine woods, 1800 m, *P.M. Peterson & Annable* 5804 (ENCB, US). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, *P.M. Peterson & Annable* 5965 (ENCB, US).

55. *Bouteloua hirsuta* Lag., Varied. Ci. 2(4): 141. 1805.

Perennial; densely or loosely caespitose, occasionally stoloniferous. Culms 15–75 cm tall, erect or decumbent, sometimes branched basally, sometimes branched aerially, nodes 3–6, internodes glabrous or sparsely to densely pubescent with papillose-based hairs. Leaves basal or mainly cauline; sheaths mostly glabrous, finely scabrous, or pubescent, pilose near the ligules; ligules 0.2–0.5 mm long, of hairs; blades 1–30 cm long, 1–2.5 mm wide, flat to involute, papillose-based hairs often present on both surfaces, usually present on the bases of the margins. Panicles usually with 0.7–18 cm rachises bearing 1–6 branches, the branches sometimes digitate; branches 10–40 mm long, persistent, straight, with 20–50 spikelets, axes extending 5–10 mm beyond base of the terminal spikelets; disarticulation above the glumes. Spikelets pectinate, green to dark purple, with 1 bisexual floret and 1–2 rudimentary florets; glumes acuminate or awn-tipped; lower glumes 1.4–3.5 mm long; upper glumes 3–6 mm long, midveins with papillose-based hairs; lowest lemmas 2–4.5 mm long, pubescent, 1- to 3-awned, central (or only) awns 0.2–2.5 mm long, not flanked by membranous lobes, lateral lobes acuminate, unawned or with awns no longer than the central awn; lower paleas ovate, unawned; anthers 2–3.4 mm long, cream or yellow; rachilla internodes subtending second florets glabrous or pubescent, sometimes with a distal tuft of hairs; second lemmas 0.5–2 mm long, bilobed, 3-awned, awns 2–4(6) mm; third lemmas, if present, minute, membranous scales, glabrous. Caryopsis 1.5–2.6 mm long.  $2n = 20, 40, 50, 60$ ; numerous diploid numbers also reported.

*Bouteloua hirsuta* is a widespread species with two varieties.

# KEY TO VARIETIES OF *BOUTELOUA HIRSUTA*

1. Culms glabrous below the nodes . . . . . *B. hirsuta* var. *hirsuta*
1. Culms hispidulous with papillose-based hairs below the nodes . . . . . *B. hirsuta* var. *glandulosa*

*Bouteloua hirsuta* var. *glandulosa* (Cerv.) Gould, J. Arnold Arbor. 60(2):320. 1979. *Erucaria glandulosa* Cerv., Naturaleza 1: 347. 1870.

**DISTRIBUTION AND HABITAT.** *Bouteloua hirsuta* var. *glandulosa* grows in grasslands and thorn scrublands at 2,100 m. It occurs in the United States, Mexico, and Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20027, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Chihuahua:** 25 km W of Chihuahua, 20 Aug 1939, *L.H. Harvey* 1540 (US).

*Bouteloua hirsuta* var. *hirsuta*.

*Bouteloua hirsuta* var. *palmeri* Vasey ex Beal.

FIGURE 48

**DISTRIBUTION AND HABITAT.** *Bouteloua hirsuta* Lag. var. *hirsuta* grows in open grasslands, desert scrub, and oak–pine forests at 1,800–2,370 m. It occurs in Canada, the United States, and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5364 (UACJ); km 1891 carr. [hwy] Juárez, sur [S] de Gallegos, 1 Dic

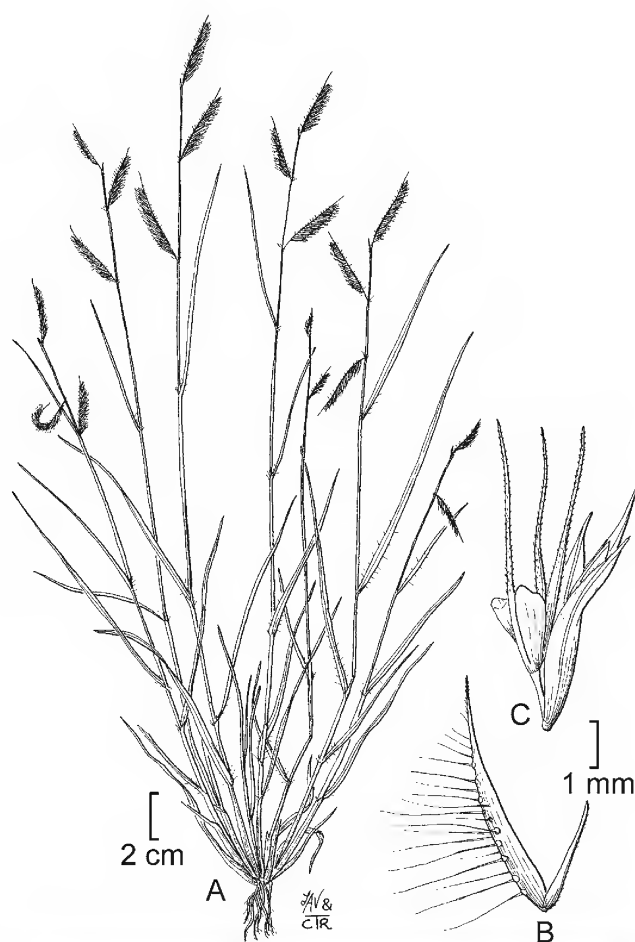


FIGURE 48. *Bouteloua hirsuta* var. *hirsuta*. A. Habit. B. Glumes. C. Florets. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

54, 1400 m, *Hern.-Xol. & C. Tapia* N-1158 (RELC); 4 km al S de Estación Fernández, 10 Aug 1975, bosque de pino-encino [pine-oak forest], *J.M. Peña* JMP-124 (RELC). **Aldama:** 13.3 (rd) mi NE of Aldama along Chihuahua Hwy 16, 14 Sep 1972, 1400 m, *J. Henrickson* 7519 (NMC). **Camargo:** Sierra de los Organos, 8 Sep 1937, *LeSueur* 0165 (US). **Casas Grandes:** El Alamito, Col. Cuauhtémoc, 12 Aug 1999, *P. Olivas, R. Rivas, I. Enríquez & A. Márquez* POS 839 (UACJ). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela* 22126 (US). **Chihuahua:** Chihuahua, 14 Oct 1910, *Hitchcock* 7795 (US); Rancho La Campana, potreros del lado W [paddocks on W side], km 80 autopista Chihuahua-Cd. Juárez, 25 Nov 1994, pastizal natural [natural pasture], 1590 m, *Y. Herrera & M.E. Siqueiros* 1341 (CIIDIR). km 52 Chihuahua-Juárez, 3 Aug 1978, pastizal,

1450 m, *Enríquez-Delgadillo* 26 (CIIDIR); hills and plains near Chihuahua, Aug 1885, *C.G. Pringle* 409 (US); La Campana, Potrero La Sierra, 1 km Pte. carr. [hwy] Panamericana, 31 Aug 1973, pastizal, 1500 m, *Valdés-Reyna* VR-52 (RELC). **Guachochi:** NW of Norogachic, ca. 3 road miles; airport near locality called Achiachic, 23 Aug 1978, bosque de pino, 2500 m, *Bye* 8761 (MEXU). 1–2 km S of Río Osichi and Río Basihuare jct, 1 Sep 2003, bosque de *Quercus-Pinus*, 1600 m, *P.M. Peterson & P. Catalán* 17644 (CIIDIR, US); 9 mi S of Guachochi at edge of Barranca Rio Verde, 1 km along trail descending into canyon, 6 Oct 2000, bosque de pino, 2470 m, *P.M. Peterson & J. Cayouette* 15378 (US). **Guerrero:** 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, *P.M. Peterson, Annabelle & Y. Herrera* 7986 (ENCB, US); km 91 Yeporema-San José Babicora, al N de Vicente Guerrero, 29 Oct 1954, *Hern.-Xol. & C. Tapia* N-415 (US); S of Mesa Colorada, on S side of Arroyo Ancho, 28 Aug 1954, *Bye* 8925 (US). **Janos:** Chihuahua-Sonora Border, Rancho Carretas, 27 Aug 1939, 1460 m, *L. H. Harvey* 1632 (US); Rancho El Carrizo, 30 Sep 1982, 1600 m, pastizal mediano abierto [mostly open grassland], *P. Rojas s.n.* (CIIDIR). **Jiménez:** Sta Eulalia Mts, *E. Wilkinson* 347 (US). **Madera:** between Col. García and Pratt's Rancho below Pacheco, 22–24 Aug 1899, *E.W. Nelson* 6246 (US); Mesa del Yerbániz, ejido El Largo, 12 Oct 1990, bosque de encino, 1900 m, *O. Bravo* 1833 (CIIDIR); La Tinaja, ejido El Largo, 29 Aug 1990, encino-pino, 1840 m, *O. Bravo* 1349 (CIIDIR). **Manuel Benavides:** Entre [between] Manuel Benavides & Pocitos, 2 Aug 1976, pastizal en ladera de cerro [pasture on hillside], 1342 m, *S. González & J.M. Peña* 454 (RELC). **Matachic:** SW of Matachic on slope on NW side of ridge near km 9.7 on Matachic-Cocomoarachic road, 29 Aug 1978, pine-oak, 1900 m, *Bye* 9003 (US). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional "Cascada de Basaseachic," 13.5 km from the Cahuisori-Ocampo road on the road to Candamena, 3 km below Cruz Verde, 23 Sep 1994, 1680 m, *Spellenberg, Corral & Estrada* 12154 (NMC); Parque Nacional "Cascada de Basaseachic," 200 m upstream from the top of the falls along the Rio Basaseachi, 11 Nov 1989, 2000 m, *Spellenberg, R. Corral, J. Brunt & L. Huenneke* 10078 (NMC). **Riva Palacio:** Majalca, 18–20 Aug 1935, *LeSueur* Mex-020 (US).

56. *Bouteloua johnstonii* Swallen, Proc. Biol. Soc. Wash. 56: 79. 1943.

Perennial; densely caespitose, rhizomatous. Culms 10–30(45) cm tall, strongly based. Leaves basal; sheaths glabrous, margins hyaline; ligule 0.5 mm long, a fringe of hairs, leaf blades 5–12 cm long, 1–2 mm wide, curved, involute for entire length, apically rigid and spine-like, densely lanate-pubescent adaxially and glabrous at maturity. Panicle axis 7–10 cm long, tip subulate, composed of 6–12 unilateral branches, branches 8–15 mm long, 5–10 mm wide, bearing 7–11 appressed spikelets, sessile. Spikelets 5–9 mm long, cuneate, laterally compressed, falling entire; glumes unequal, glabrous, often purplish, lanceolate, apex acute to setaceously attenuate, thinner than fertile lemma, membranous, 1-keeled, 1-veined, lateral veins absent, lower glume

3–4 mm long, upper glume 5–7 mm; lemma 5–7 mm long, ovate, keeled, 3-veined, apex lobulate, 3-awned, awns 2–3 mm long, subequal, central awn among 2 lobes; palea 4–4.2 mm long, glabrous; anthers 2–2.2 mm long, yellowish, filaments pubescent; apical sterile florets 1–2, rudimentary, sterile lemma 3-awned, awns 2–3 mm. Caryopsis 2–2.2 mm long, yellow, oblong-ellipsoid.

**DISTRIBUTION AND HABITAT.** *Bouteloua johnstonii* is an endemic species in the north of Mexico that grows in gypsum and calcium soils in scrub communities and grasslands. It occurs in the states of Chihuahua and Coahuila.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Camargo: Sitio 17B, Rancho Epigmenia, 25 Aug 2015, 27°46'37.7"N, 104°09'10.8"W [27.77722°N, 104.15306°W], matorral desértico con [desert scrub with] *Yucca carnerosana*, 1627 m, J. Santos & A. Olivas s.n. (CIIDIR, UACH).

57. *Bouteloua karwinskii* (E. Fourn.) Griffiths, Contr. U.S. Natl. Herb. 14(3): 394. 1912.

Perennial; rhizomatous. Culms 20–55 cm tall, erect, branched from the base, internodes glabrous. Sheaths shorter than internodes, glabrous, marginally ciliate, with some large hairs over the throat; ligule 0.3 mm long, a ciliate ring; blades 3–9 cm long, 1–2 mm wide, flat, scabrous, loosely pilose on the adaxial surface, curved. Panicle 1.5–5(8) cm long, conformed by 3–6 persistent spikes (branches), branches 1–1.8 cm long, spaced out and almost erect, containing 16–32 spikelets. Spikelets 3–3.5(4) mm long, disarticulating over the glumes; glumes unequal, glabrous, sparsely pubescent over the keel, lower glumes 1.5–2 mm long, narrow, acuminate, upper glumes 2–2.5 mm long, wider than the lower glume; lemma of the bisexual floret 2.5–3.2 mm long, sparsely plicate-pubescent over the veins and the base, the lateral veins excurrent into strong awns, awns 1–1.5 mm long, not exceeding the acute apex of the lemma. Rudimentary florets (1)2, lemma of the first rudimentary floret 1 mm long with 3 veins prolonged into awns of 1.5 mm long, second rudimentary floret 1 mm long including the 3 scabrous awns, rachilla glabrous at the base of the rudimentary floret. Caryopsis 0.7–1 mm long, light yellow to brown when mature, narrowly elliptic.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua karwinskii* grows on grasslands and scrub communities over gypsum soils. It is an endemic species in Mexico known from Coahuila, Nuevo León, San Luis Potosí, and Zacatecas and now found in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Sitio 27B, Torreño # 3, 2 Sep 2015, 29°04'45"N, 105°45'49"W [29.07917°N, 105.76361°W], matorral subinermé [mostly unarmed scrub] con *Fouquieria splendens*, *Tecoma stans*, *Acacia neovernicosa* & *Cassia wislizenii*, 1380 m, J. Santos & A. Olivas 528B (CIIDIR, UACH).

58. *Bouteloua media* (E. Fourn.) Gould & Kapadia, Brittonia 16(2): 196, f. 35. 1964. *Atheropogon medius* E. Fourn., Mexic. Pl. 2: 139. 1886.

Perennial; caespitose, basally nudose. Culms 80–200 cm tall, erect, with 4–7 nodes purple, simple, occasionally branched on the superior nodes. Sheaths scabrous or papillose-hirsute, sparsely pilose on the margins and near the throat; ligules 0.5–0.7 mm long, membranous, minutely ciliate; blades 30–45 cm long, 4–6(9) mm wide, flat, scabrous or papillose-hirsute. Inflorescence 20–25 cm long, terminal and axillary, branches 20–40, 1–2 cm long, inclined, deciduous when mature, bearing 7–13(20) spikelets, rachis scabrous, spikelets congested; axillary inflorescences shorter than the nodes, placed below the terminal node, with thinner axes, short, with fewer number of spikelets per branch. Spikelets 5–6 mm long, some abortive, inserted in the spikes; glumes unequal, lower glumes 3.8–4.5 mm long, narrow, acute, attenuate or setaceous, with membranous base, scabrous to pubescent on the keel, upper glumes 4.5–5.5 mm long, widely lanceolate, acute to acuminate, sparsely pilous to scabrous on the keel; lemmas of the bisexual floret 5–5.5 mm long, scabrous to puberulent, 3-veined, veins excurrent into 3 short awns, scabrous; paleas equal in size about as long as the lemma, minutely pubescent; anthers 2.8–3.5 mm long, yellow or orange; rudimentary florets 1–2, sterile, lemma of the first floret rudimentary, 3–3.5 mm long, membranous, 5-awned, awns 4–5 mm long, scabrous, central awn 5–10 mm long, strong and scabrous; lemmas of the second floret when present 2.5–3 mm long. Caryopsis 2.2–2.5 mm long, slender, yellow, ovoid to narrowly elliptic.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua media* grows in grasslands, scrub communities, and, less commonly, tropical forest. It ranges from Mexico to Central America and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** West of Munérachi, 7 Sep 2003, matorral espinoso [thorny scrub], 1200 m, P.M. Peterson & P. Catalán 17711 (US). **Guadalupe:** NE Chihuahua, vicinity of Rancho El Pino, ca 10 km SE of Sierra Rica, 23 Sep 1942, R. Stewart 2406 (US).

59. *Bouteloua parryi* (E. Fourn.) Griffiths, Contr. U.S. Natl. Herb. 14(3): 381, f. 37, pl. 73. 1912. *Chondrosium parryi* E. Fourn., Mexic. Pl. 2: 150. 1886.

FIGURE 49

Annual or short-lived perennial; tufted, sometimes stoloniferous. Culms 20–60 cm tall, erect or somewhat geniculate at the base. Leaves mostly basal; sheaths pubescent, usually with tufts of long hairs on either side of the collar; ligules 0.1–0.5 mm long, of hairs; blades 1–3 cm long, 1–2.5 mm wide, margins and usually both surfaces with papillose-based hairs. Panicles 2.5–10 cm long, with 4–8 branches; branches 20–35 mm long, persistent, with papillose-based hairs, with 40–65 spikelets, branches terminating in a spikelet; disarticulation above the glumes. Spikelets pectinate, with 1 bisexual floret and 2 rudimentary florets; glumes unequal; lower glumes about 2 mm long, glabrous or sparsely pubescent at the base, mucronate; upper glumes 3–4 mm long, keels with papillose-based hairs, apex bilobed, awned from





FIGURE 49. *Bouteloua parryi*. A. Habit. B. Spikelet. C. Lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

between the teeth, awns to 0.7 mm long; lowest lemmas 3–4 mm long, pilose or villous proximally, 3-awned, awns 2–3 mm long, central awns flanked by 2 membranous lobes; lowest paleas about 2.5 mm long, 4-lobed, 2-awned; anthers 1.8–2 mm long, yellow; rachilla internodes subtending second florets with densely pubescent apex; second florets lobed nearly to the base, lobes ovate, awns 2–4 mm long, exceeding those of the lowest lemmas, third florets minute scales, glabrous, unawned or with a single awn. Caryopsis 1.3–1.5 mm long,  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua parryi* grows on sandy slopes and flats at elevations from near sea level to 2,000 m. Its range extends from the southwestern United States to central Mexico; only *Bouteloua parryi* var. *parryi* occurs in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Casas Grandes: 1.6 mi NE Col. Juárez SW Casas Grandes, 30 Aug 1986, *Spellenberg & R. Corral* 8586 (NMC). Chihuahua: km 153 Chihuahua–Sueco, 6 Oct 77, pastizal [pastureland], 1570 m, *A. Melgoza-Peña-Martín s/n* (RELC). Ojinaga: 5 km al Pte. del Rancho Escobillas, 30 Oct 74, pastizal, *Valdés-Reyna VR-828* (RELC).

60. *Bouteloua radicata* (E. Fourn.) Griffiths, Contr. U.S. Natl. Herb. 14: 411, t. 81. 1912. *Atheropogon radicosus* E. Fourn., Mexic. Pl. 2: 140. 1886.

FIGURE 50

Perennial; with a dense, hard, knotty base, rhizomatous, rhizomes 2–3 mm thick, with pale cataphylls, internodes 4–5 mm long. Culms (40)60–80 cm tall, erect, straight, unbranched. Sheaths strongly striate; ligules 0.5–1 mm long, of hairs; blades mostly basal, short and firm, 2–3 mm wide, bases with papillose-based hairs on the margins. Panicles 10–15 cm long, usually with 7–12 branches; branches (15)20–30 mm long, deciduous, with 8–11 spikelets, apex entire; disarticulation at the base of the branches. Spikelets 9–13 mm long, appressed, all alike, with 2 florets, lowest floret bisexual, upper florets pistillate, bisexual, or staminate; glumes acuminate, glabrous; lower glumes about 4 mm; upper glumes 5–6 mm; lowest lemmas 7–8 mm long, smooth, often shortly trilobed, 3-awned, awns excurrent from the lobes, central awns 2–3 mm long, not flanked by membranous lobes, lateral awns about 1 mm; lower paleas 6–7 mm long, unawned, sometimes mucronate; upper lemmas 9–10 mm long, central awns 6–8 mm long, lateral awns 5–6 mm; upper paleas similar to the lower paleas. Caryopsis 4–5 mm long, 0.75–1 mm wide.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua radicata* grows on dry, rocky slopes at 1,000–3,000 m, from Arizona and southern New Mexico to southern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: SW Chihuahua, Aug 1885, *E. Palmer* 115-A (US). Casas Grandes: Casas Grandes, 25 Aug 1899, *E. W. Nelson* 6305 (US); 18 mi W of Col. Juárez, 2073 m, *Reeder & C. Reeder* 3205 (US). Guachochi: Parque Nacional Barranca del Cobre, 3.8 km

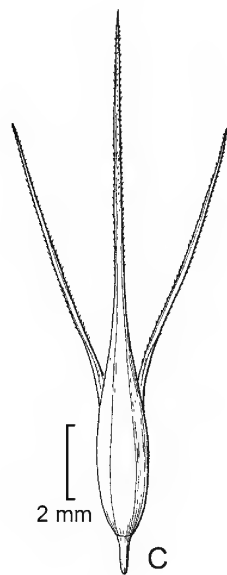
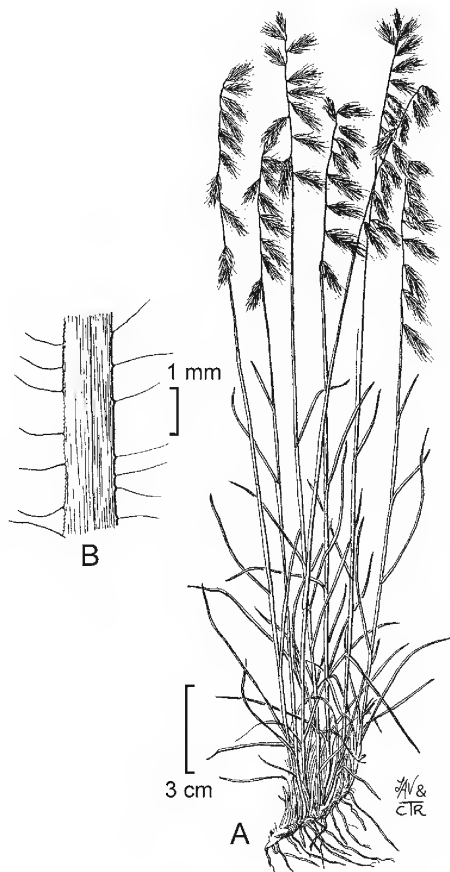


FIGURE 50. *Bouteloua radicosa*. A. Habit. B. Leaf blade with papillose-based hairs. C. Lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



NE of La Bufa and 9.6 km S of Kirare, 1240 m, *P.M. Peterson, Annable & Valdés-Reyna* 10836 (US). **Guerrero:** near Guerrero, 11 Sep 1887, *C.G. Pringle* 1436 (US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, 1460 m, *L. H. Harvey* 1612 (US). **Madera:** near Col. García in the Sierra Madre, 5 Aug 1899, *C.H.T. Townsend & C.M. Barber* 226 (NMC, US); between Col. García and Pratt's Rancho below Pacheco, 22–24 Aug 1899, *E.W. Nelson* 6258 (US); Mesa del Yerbánis, ejido El Largo, 12 Oct 1990, bosque de encino [oak forest], 1900 m, *O. Bravo* 1858 (CIIDIR). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional "Cascada de Basaseachic," 15 km from the Cahuisori–Ocampo road on the road to Candamena, 4.3 km below Cruz Verde, 23 Sep 1994, 1570 m, *Spellenberg, Corral & Estrada* 12168 (NMC).

61. *Bouteloua ramosa* Scribn. ex Vasey, U.S.D.A. Div. Bot. Bull. 12(1): t. 44. 1890.

FIGURE 51

Perennial; densely caespitose, bases hard, knotty, without rhizomes or stolons. Culms 25–60 cm tall, numerous, somewhat woody at the base, geniculate, branching profusely from the lower nodes; nodes usually 4–5; lower internodes glabrous, without a conspicuous, white, chalky bloom. Ligules 0.1–0.2 mm long, of hairs; blades 2–7 cm long, 1–2 mm wide, mostly flat but the tips involute. Panicles 1–3(5) cm long, with 1–3(4) branches; branches 10–35 mm long, persistent, ascending to widely divergent, becoming arcuate, dark, with 24–45(64) spikelets, branches terminating in a reduced, needlelike, 2–5 mm spikelet; disarticulation above the glumes. Spikelets with 1 bisexual floret and 1–2 rudimentary florets; glumes acute to acuminate, glabrous or sparsely short-hairy, hairs not papillose-based; lower glumes 2–2.5 mm long; upper glumes 2–3.5 mm long; lowest lemmas 2.5–4 mm long, sparsely to densely hairy, 3-awned, awns slightly shorter than the lemma bodies, central awns flanked by 2 membranous lobes; lowest paleas about 4.5 mm long, mostly glabrous, sometimes puberulent distally, acute to acuminate, veins not excurrent, unawned; second florets about 4.5 mm long, 3-awned, awns 3–5 mm long; rachilla internodes subtending second florets with densely pubescent apex; third florets, if present, flabellate scales, 1-awned. Caryopsis 1–1.2 mm long, about 0.4 mm wide.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua ramosa* is locally common on rocky limestone slopes and flats among shrubs and *Agave lecheguilla*. Its range extends from the Trans Pecos region of western Texas to adjacent northern Mexico, particularly in the Chihuahuan Desert.

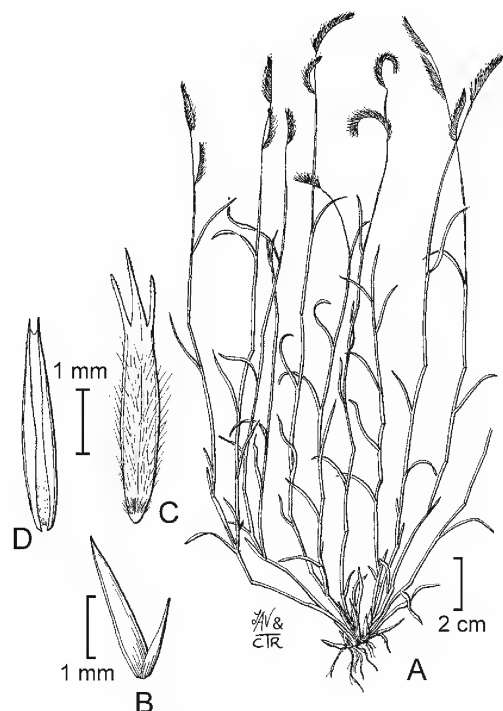


FIGURE 51. *Bouteloua ramosa*. A. Habit. B. Glumes. C. Lower lemma. D. Lower palea. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Jiménez: Sta. Eulalia Mts., Pringle 414 (US); 50 km al S de Jiménez, 15 Aug 2010, 1442 m, D. Ramírez & M.L. Juárez 3417 (CHDIR); 13 km S of Cd. Jimenez, 30 Jul 1939, L. H. Harvey 1339 (US).

62. *Bouteloua repens* (Kunth) Scribn. & Merr., Bull. Div. Agrostol. U.S.D.A. 4: 9, 1897. *Dinebra repens* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 172, t. 52. 1815.

FIGURE 52

Perennial; caespitose, usually not dense, hard, or knotty, without rhizomes or stolons. Culms 15–65 cm tall, erect, geniculate, or decumbent, sometimes rooting at the lower nodes, usually branching from the aerial nodes. Sheaths glabrous or pubescent; ligules 0.2–0.3 mm long, membranous, ciliate; blades 5–20 cm long, 1–5 mm wide, bases with papillose-based hairs on the margins, both surfaces glabrous or pubescent. Panicles 4–14 cm long, with (3)7–12 branches; branches 10–20 mm long, with 2–8 spikelets, extending 4–6 mm beyond the base of the terminal spikelets, apex entire; disarticulation at the base of the branches. Spikelets 6–9 mm long, appressed, all alike, with

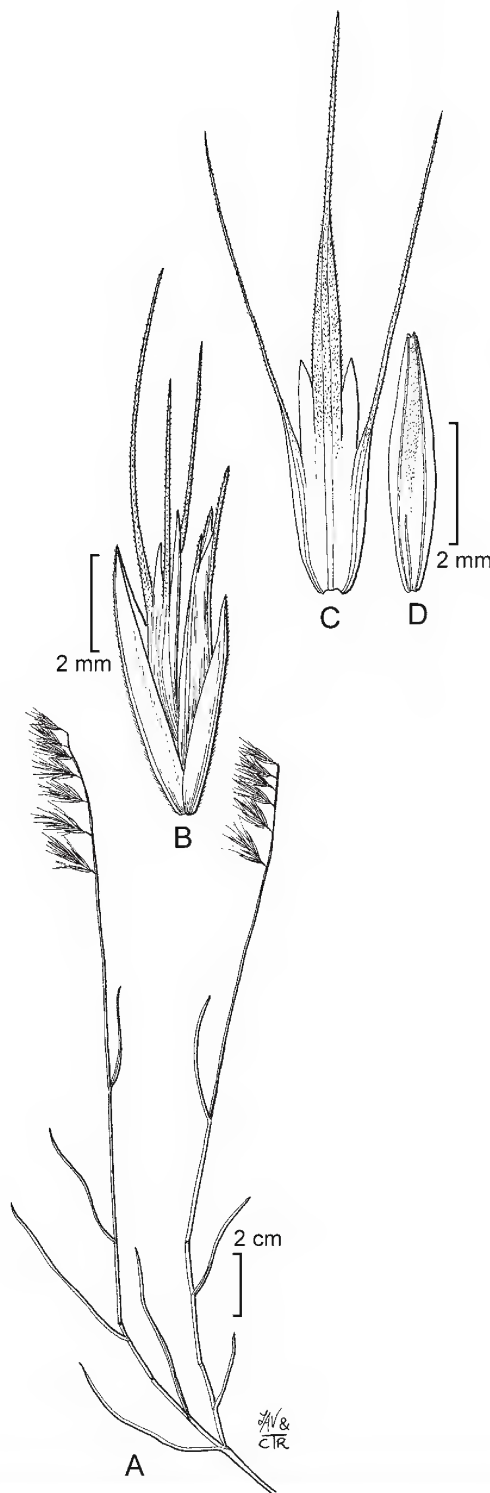


FIGURE 52. *Bouteloua repens*. A. Habit. B. Spikelet. C. Lemma. D. Palea. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

1 bisexual and 1 staminate (rarely rudimentary) floret; glumes glabrous, veins scabrous or strigose; lower glumes 4–7 mm long; upper glumes 4–9 mm long, mostly glabrous, sometimes scabrous or strigose over the veins, apex acute, unawned or awn-tipped, awns about 1 mm; lowest lemmas 4.5–8 mm long, usually glabrous, rarely pubescent basally, 3-awned, awns wide basally, central awns slightly longer than the lateral awns, often flanked by 2 membranous 0.5–1.5 mm long lobes; lowest paleas 6–8 mm long, bilobed, often shortly 2-awned; anthers 3–5.5 mm long, usually orange or yellow, occasionally red or purple; second lemmas 5.5–7 mm long, glabrous, 3-awned, central awns 4–10 mm long, often flanked by membranous lobes, lateral awns 2–10 mm long; second paleas 4–7 mm long; anthers less than those of the lowest florets; rachillas prolonged beyond the second florets as a short bristle. Caryopsis 3–4 mm long.  $2n = 20, 40, 60$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua repens* grows in open, usually hilly terrain on many soil types, from sandy ocean shores to montane slopes, reaching elevations of 2,500 m. Its native range extends from the southwestern United States to Mexico and Central America to Colombia and Venezuela; it also occurs in the Caribbean Islands.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 65 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino-encino [pine-oak forest], 1891 m, *P.M. Peterson & P. Catalán* 17534 (US). **Madera:** Paraje Sirupa, ejido Cebadilla de Dolores, 24 Aug 1990, bosque de encino, 1220 m, *O. Bravo* 1262 (CIIDIR).

**63. *Bouteloua scorpioides* Lag., Gen. Sp. Pl. 5. 1816.**

Perennial; mat-forming. Culms 10–20(30) cm tall, erect, few branched at the base. Leaves basal; sheaths glabrous, with hyaline margins, throats pilose with a tuft of hairs of 1–3 mm; ligules 0.5–1 mm long; blades 2.5–13 cm long, involute, filiform, recurved or flexuous. Inflorescence 1 spike, 2.5–4(5) cm long, unilateral, arched-recurved, persistent, insert in culm apex, bearing 35–90 spikelets. Spikelets 5–7 mm long, with 1 bisexual floret and 2 rudimentary, disarticulation above glumes; glumes subacute, glabrous, greenish or with purple spots, the lower 2–3 mm long, narrow, the second 4–7 mm; lemmas of the bisexual floret 3.5–5.5 mm long, basally bearded and densely pilose over the margins and veins of the inferior  $\frac{1}{2}$ , veins excurrent in strong awns, 1.5–2 mm the central, 1–1.5 mm the lateral; anthers 3 mm long, orange; first rudimentary floret 5.5–6 mm long, 3-awned, awns 1.5–4 mm long, with a basal tuft of hairs. Caryopses 1.8–2.4 mm long, yellow to brown, angulose-triangular.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua scorpioides* grows in grassland, desert scrub, and pine-oak forests at 1,800–2,570 m. Its range extends into Mexico in Chihuahua, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Morelos, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: Encinillas, 13 Sep 1906, *D. Griffiths* 8527 (US); Campero, 30 Aug 1906, *D. Griffiths* 8462 (US).

**64. *Bouteloua simplex* Lag., Varied. Ci. 2(4): 141. 1805.**

*Bouteloua procumbens* (P. Durand) Griffiths.

FIGURE 53

Annual. Culms 3–35 cm tall, usually decumbent, occasionally erect, rarely branching; internodes glabrous. Sheaths smooth, deeply striate; ligules 0.1–0.2 mm long, of short hairs, sometimes with a few papillose-based hairs on either side; blades 2–8 cm long, 0.5–1.5 mm wide, flat to involute, adaxial surfaces mostly glabrous, often pilose basally. Panicles usually with only 1 branch (terminating the culm), or with 2–4 branches and subdigitate; branches 10–25(40) mm long, persistent, straight, arcuate, or circular, with 30–80 spikelets, axes terminating in a reduced spikelet; disarticulation above the glumes. Spikelets pectinate, with 1 bisexual floret and 1–2 rudimentary florets; glumes glabrous, sometimes scabrous distally, acute or acuminate; lower glumes 1.5–2.5 mm long; upper glumes 3.5–5 mm long; lowest lemmas 2.5–3.5 mm long, pilose over the veins, 3-awned, awns stout and flattened, central awns 1–2 mm long, flanked by 2 membranous lobes, lateral awns shorter than the central awns; lowest paleas obovate, unawned; rachilla internodes subtending second floret with densely pubescent apex; second floret reduced to an awn column with 3 awns of 5–6 mm; third floret, if present, flabellate scales.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua simplex* grows on rocky, open slopes in grassy and open shrub vegetation at 1,200–2,500 m. Its native range extends from the southwestern United States through Mexico and Central America to western South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 43.5 km W of Balleza and 51.6 km E of Guachochi, 18 Sep 1991, 2320 m, *P.M. Peterson, Annable & Valdés-Reyna* 10761 (CIIDIR); 69.2 km al E de Guachochi and 25.7 km W of Balleza, 26 Sep 1988, 2100 m, *P.M. Peterson & Annable* 5939 (US). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 3 (US). **Chihuahua:** La Campana, Potrero El Bajío, Ote. [W] carr. [hwy] Panamericana, 13 Sep 73, pastizal halófito [halophyte grassland], 1480 m, *Valdés-Reyna* VR-244, VR-320 (RELC). **Gómez Farías:** Laguna de Babicora, 18 Aug 1994, 2150 m, *T. Lebgue & E. Estrada* 3490 (NMC). **Guachochi:** 12.4 km S of Cusarare on road to Guachochi, 25 Sep 1988, pine forest, 2400 m, *P.M. Peterson & Annable* 5893 (US); flat rock at Napuchis, 2 Sep 2003, pastizal [pastureland], 2140 m, *P.M. Peterson & P. Catalán* 17671 (CIIDIR, US). **Guerrero:** near Guerrero, 8 Sep 1887, *C.G. Pringle* 1434 (US); 35.4 km SW of La Junta and approx. 74 km N of Creel, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable* 5832 (US). **Hidalgo del Parral:** 5.5 mi NW of Parral, 2 Oct 1959, *Correll & Gentry* 22705 (US). **Madera:** 3 km al NE de Madera, 5 Oct 74, bosque de pino [pine forest], 2100 m, *Valdés-Reyna & L.C. Fierro* VR-685 (RELC). **Riva Palacio:** Col. Cumbres de

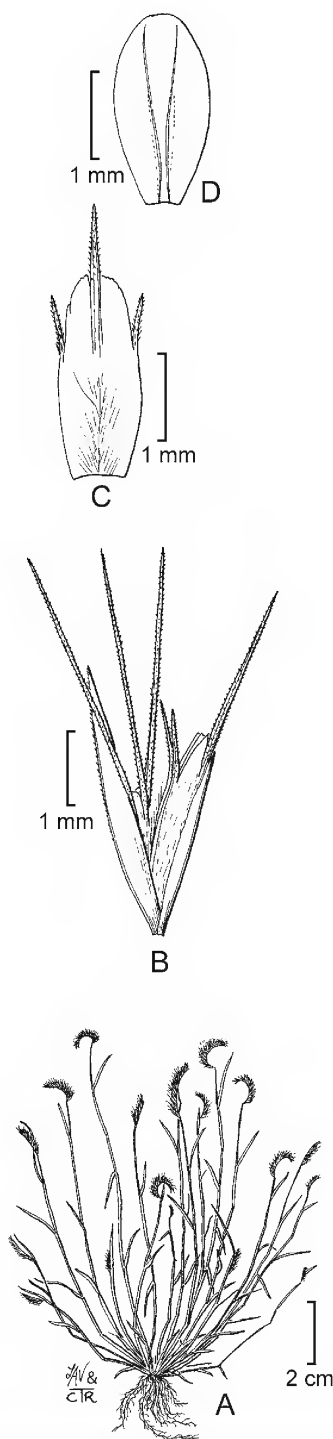


FIGURE 53. *Bouteloua simplex*. A. Habit. B. Spikelet. C. Lower lemma. D. Lower palea. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pinyon forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7951 (ENCB, US).

65. *Bouteloua trifida* Thurb., Proc. Amer. Acad. Arts 18. 177. 1883.

FIGURE 54

Perennial; caespitose, older plants occasionally short rhizomatous. Culms 5–40 cm tall, slender, wiry, erect or slightly geniculate at the lower nodes; lower internodes glabrous, shorter than those above. Leaves mostly basal; sheaths glabrous, sometimes scaberulous, becoming flat, persistent; ligules 0.2–0.5 mm long, of hairs; blades 0.7–8 cm long, 0.5–1.5(2) mm wide, scaberulous, margins often with papillose-based hairs basally. Panicles 3–9 cm long, with 2–7 branches; branches 7–25 mm long, persistent, spreading, ascending, or appressed, straight to slightly arcuate, with 8–24(32) spikelets, axes terminating in a spikelet; disarticulation above the glumes. Spikelets appressed to pectinate, reddish-purple; with 1 bisexual floret and 1 rudimentary floret; glumes bilobed; lower glumes 1.7–3.4 mm long, slightly shorter than the upper glumes, veins excurrent to 0.6 mm; upper glumes 1.9–4 mm long, glabrous or pubescent, hairs not papillose-based, veins excurrent to 1 mm; lower lemmas 1.2–2.2 mm long, glabrous, sparsely appressed-pubescent along the veins or densely appressed-pubescent for much of their length and on the margins, trilobed, lobes veined, tapering into 3 awns, awns 2.2–6.6 mm long, central awns not flanked by membranous lobes; anthers 0.2–0.4 mm long, yellow; rachilla internodes glabrous; upper florets glabrous, 3-awned, awns equal, 2–7 mm. Caryopsis 0.8–1.5 mm long, 0.3–0.6 mm wide.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua trifida* grows on dry open plains, shrubby hills, and rocky slopes at 2,200–2,500 m. Its range extends from the southwestern United States to central Mexico. It is a drought-resistant species that is sometimes confused with *B. barbata*, but that species is annual, with the central awn flanked by 2 membranous lobes and the lowest paleas 4-lobed and 2-awned.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: near Chihuahua, 25 Aug 1885, C.G. Pringle 412 (US). Jiménez: Sta Eulalia plains, 1885, E. Wilkinson 205 (US). Valle de Zaragoza: 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, P.M. Peterson & Annable 8101 (US).

66. *Bouteloua uniflora* Vasey, Bot. Gaz. 16: 26. 1891.

FIGURE 55

Perennial; caespitose, without rhizomes or stolons. Culms 20–60 cm tall, stiffly erect, glabrous. Sheaths mostly glabrous, a few long hairs present near the ligules; ligules 0.2–0.5 mm long, of hairs; blades 6–16 cm long, 1–2 mm wide, involute when dry, glabrous, bases usually with papillose-based hairs on the margins. Panicles 5–10(14) cm long, with 15–70 branches; branches



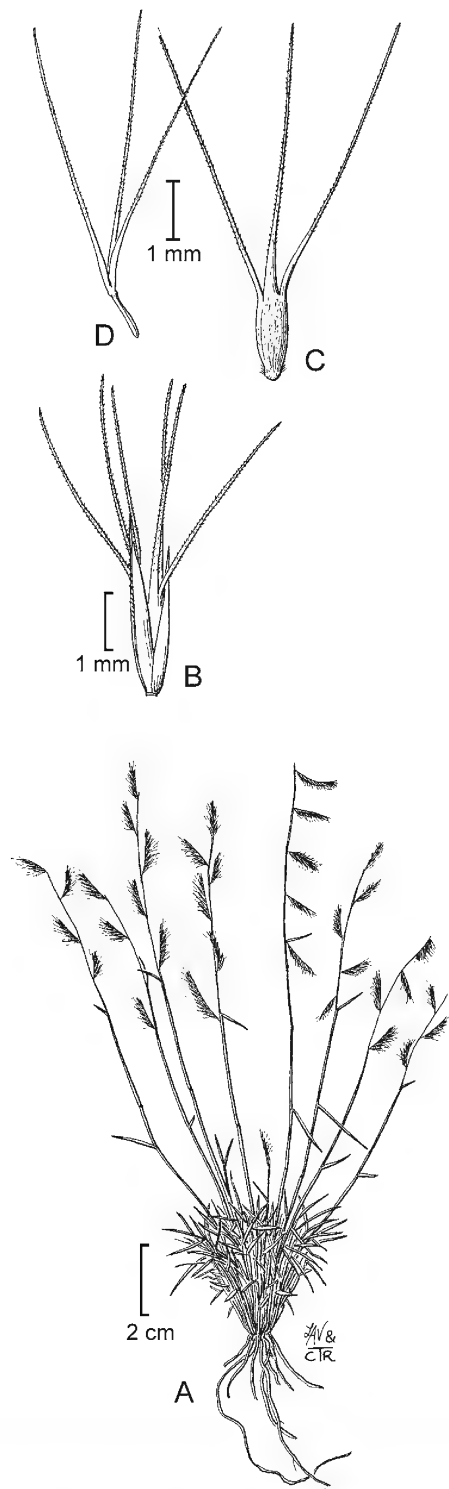


FIGURE 54. *Bouteloua trifida*. A. Habit. B. Spikelet. C. Lower lemma. D. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

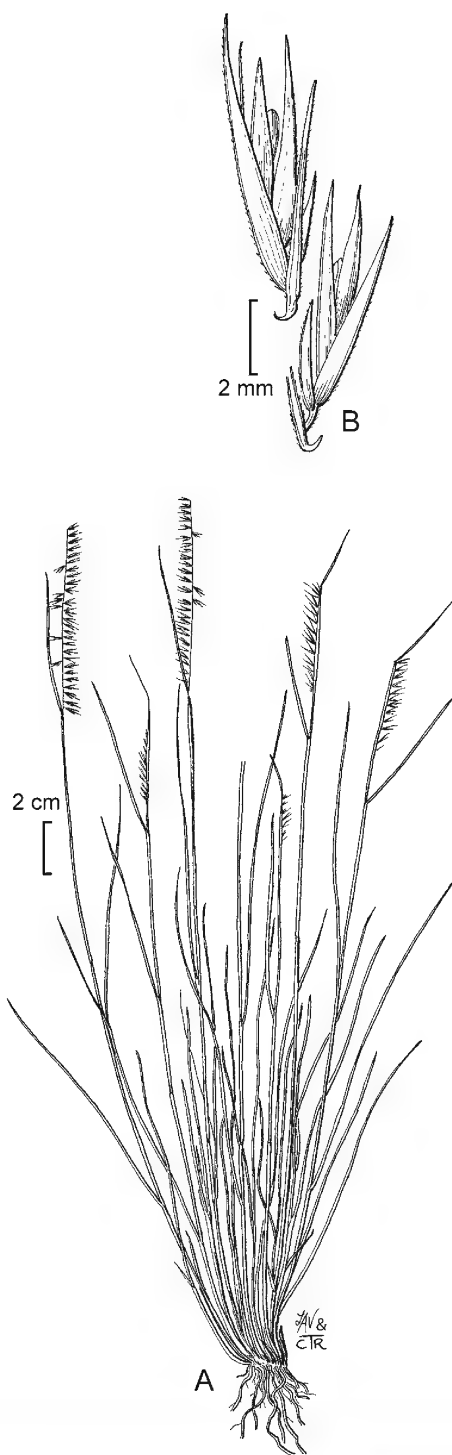


FIGURE 55. *Bouteloua uniflora*. A. Habit. B. Inflorescence branches. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

5–9 mm long, deciduous, scabrous, with 1 spikelet (lower branches occasionally with 2 spikelets), axes extending 3–4 mm beyond the terminal spikelets, apex entire; disarticulation at the base of the branches. Spikelets appressed, with 1 bisexual and 0 or 1 rudimentary florets; glumes acute to slightly cleft and minutely apiculate, midveins usually scabrous; lower glumes 2.5–4 mm long; upper glumes 6.2–8 mm long, mostly smooth, midveins usually scabrous; lowest lemmas 6–7.5 mm long, acute or minutely cleft, glabrous, unawned, sometimes mucronate; lowest paleas unawned, glabrous; anthers 2.5–3 mm long, bright yellow; second florets absent or reduced to 1 or 3 short awns, glabrous. Caryopsis about 3 mm long.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Bouteloua uniflora* grows primarily in fertile, rocky, limestone soils of Texas and adjacent Coahuila, Mexico at 300–1,000 m. Plants in the region belong to *Bouteloua uniflora* var. *coahuilensis* Gould & Kapadia, which differs from *Bouteloua uniflora* var. *uniflora*, in having smaller (20–40 cm long, not 40–60 cm) and scapose rather than leafy culms, shorter leaf blades (6–12 cm versus 12–16 cm), and 15–40 rather than 50–70 panicle branches.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** km 100 carr. [hwy] Chihuahua–Ojinaga, 25 Nov 1994, matorral de gobernadora [governor's scrub], 1590 m, Y. Herrera & M.E. Siqueiros 1344 (CIIDIR). **Guachochi:** along río Corareachi, 30 Aug 2003, 1840–1900 m, P.M. Peterson & P. Catalán 17599 (CIIDIR, US). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, P.M. Peterson & Annable 5964 (ENCB, US).

**67. *Bouteloua warnockii*** Gould & Kapadia, Southw. Naturalist 7(3-4): 176–181. 1962.

Perennial; caespitose, forming clumps 4–10 cm in diameter, lacking stolons and rarely having short rhizomes. Culms 20–35(50) cm tall, erect. Leaves mostly basal, bluish-green, more or less glaucous; sheaths mostly glabrous, hairs present distally; ligules 1–1.5 mm long, a fringe of hairs; blades 5–15(25) cm long, 1–1.5(2.5) mm wide, glaucous, erect or curving, involute when dry; mostly glabrous, ligular area with long and short hairs, bases usually with papillose-based hairs on the margins. Panicles 5–10(20) cm long, with 9–15(25) lax branches, branches 4–5.5 mm long, deciduous, scabrous, with 2–6 spikelets, axes terminating well beyond the terminal spikelets, apex entire, disarticulation at the base of the branches. Spikelets 5–6.5 mm long, with 1 bisexual and 1 sterile floret, appressed, all alike, green, laterally compressed; glumes unequal, shorter and thinner than the spikelet, membranous, 1-keeled, 1-veined, lateral veins absent, apex acuminate, lower glume 3–5 mm long, upper glumes 4–6 mm long, glabrous, sometimes scabrous; lemma of bisexual florets 5–6.5 mm long, glabrous, coriaceous, keeled, 3-veined, acute, 3-awned, awns less than 1 mm long, central awns 0.5–1 mm long, not flanked by 2 membranous lobes; anthers 2.2–3.7 mm long, dark purple; rudimentary florets sterile, usually without paleas; lemmas reduced to a glabrous awn column, sometimes moderately well-developed and 3-awned, awns usually not exerted, central awns 2.5–4 mm

long. Caryopsis 3.2–3.6 mm long, ovoid.  $2n = 21, 22, 23, 24, 25, 28, 38, 40$ .

This species frequently grows and may hybridize with *B. curtipendula* var. *caespitosa*.

**DISTRIBUTION AND HABITAT.** *Bouteloua warnockii* grows on limestone ledges and dry slopes below limestone outcrops. Its range extends from the southwestern United States to the states of Coahuila and Chihuahua in Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Manuel Benavides:** Rancho Los Pinos, Sierra Rica, 21 Nov 2013, 29.17006°N, 104.04964°W, matorral desértico con [desert scrub with] *Yucca carnerosana*, *Mortonia semprevirens*, *Bouteloua curtipendula*, *Ephedra trifurca*, *Flourensia cernua*, and *Acacia constricta*, 1500–1800 m, A. Juárez 102 (CIIDIR, RELC).

**68. *Bouteloua williamsii*** Swallen, Ceiba 4(5): 285. 1955.

Perennial; caespitose, not rhizomatous. Culms 35–90(115) cm tall, slender, erect. Leaves basal; sheaths glabrous to hirsute; ligules 0.2–0.5 mm long, a delicate row of hairs; blades 10–25(35) cm long, 1.5–3 mm wide, flat, harsh leaves to the tact, abundantly haired, hairs 2–5 mm. Inflorescence 8–20 cm long, solitary, terminal. Spikes 5–11, 2–5(7) cm long, erect or spreading, deciduous when mature, bearing (9)12–20 spikelets, rachis flat, scabrous, with a tuft of hairs at the base of the spikelet. Spikelets 5–9 mm long, congested, persistent on each spike; glumes unequal, wide, acute or acuminate, with purple spots, lower glumes 3–4.5 mm long, slender, almost translucent, upper glumes 4.2–6 mm long; lemma of bisexual florets 4–6(7.5) mm long, firm, lateral veins excurrent into 2 awns of 2–3 mm long, central vein into a longer awn, with a tuft of hairs at the base; palea apex 2-toothed, slightly longer than lemma, pubescent between the veins; anthers 2–3 mm long, yellow; rudimentary florets 1(2), staminate, lemma of the rudimentary florets 3–4 mm long, glabrous, with a tuft of silky hairs at the base, with 3 awns of 4–6 mm long, strongly flattened at the base, rachilla prolonged, the second rudimentary floret small when present. Caryopsis 3–4 mm long, straw-colored, ovoid to narrowly elliptic.  $2n = 20$ .

This species is easily confused with *B. radicata*, which differs in its lack of rhizomes, leaves that are harsh to touch, and longer spikes with a larger number of spikelets.

**DISTRIBUTION AND HABITAT.** *Bouteloua williamsii* grows in dry soils of the oak forests, grasslands, and subtropical scrub. It is found from Mexico to Honduras.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ignacio Zaraza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, P.M. Peterson & R.M. King 8149 (US).

## ***Bromus* L.**

Perennial, annual, or biennial; usually caespitose, occasionally rhizomatous. Culms 5–150 cm tall, 1 to several per plant. Sheaths closed to near the top, glabrous to pubescent; auricles present to usually absent; ligules to 7 mm long, membranous, usually erose or lacerate; blades generally flat, rarely involute,

glabrous or pubescent. Inflorescences panicles, sometimes racemose, open to dense, erect to nodding. Spikelets 1.3–4 cm long, terete to laterally compressed; disarticulation above the glumes and beneath the florets. Glumes unequal, shorter than the adjacent lemmas, glabrous or pubescent, usually acute, rarely mucronate; lower glumes 1- to 7(9)-veined; upper glumes 3- to 9(11)-veined; lemmas rounded to keeled, glabrous or pubescent, 5- to 13-veined, apex entire, emarginate, or toothed, usually

terminally or subterminally awned, sometimes unawned; paleas usually shorter than lemmas, ciliate on the keels, adnate to the caryopsis; anthers 2–3. Caryopses somewhat ellipsoid, dorsally flattened (section *Bromus*) to terete and laterally compressed (section *Ceratochloa*).  $x = 7$ .

*Bromus* grows in temperate and cool regions, and is estimated to include 165 species (Saarela et al., 2014; Soreng et al., 2017b).

#### KEY TO SPECIES OF *BROMUS*

1. Spikelets strongly laterally compressed; lemmas strongly keeled; upper glumes 5 or more veined.
  2. Lemmas unawned or with awns up to 3 mm long; upper glumes 9(11)-veined; lemma veins usually raised ..... *B. catharticus*
  2. Lemmas awned, the awns 4–15 mm long; upper glumes 5- to 9-veined, lemma veins not raised ..... *B. carinatus*
1. Spikelets not strongly laterally compressed; lemmas rounded on the mid-rib; upper glumes 1- to 3-veined.
  3. Lemma apex conspicuously bidentate, the teeth hyaline, awnlike to acuminate; largest lemmas generally less than 2 mm wide ..... *B. tectorum*
  3. Lemma apex entire or inconspicuously bidentate, the teeth usually not hyaline; largest lemma generally greater than 2 mm wide.
    4. Plants annual; lower glumes 3(5)-veined; upper glumes 5- to 9-veined ..... *B. japonicus*
    4. Plants perennial; lower glumes 1(3)-veined; upper glumes 3(5)-veined.
      5. Most lower glumes 1-veined.
        6. Sheath auricles usually present; ligules 0.2–1.6 mm long; leaf blades 2–4 mm wide; lemmas 7–10 mm long; awns 1–3 mm long ..... *B. anomalus*
        6. Sheath auricles absent; ligules 1.5–4 mm long; leaf blades (3)4–10(13) mm wide; lemmas (9)10–13.5(15) mm long; awns 3.1–6.5 mm long ..... *B. richardsonii*
      5. Most lower glumes 3-veined.
        7. Sheath auricles absent; spikelets 2–3 cm long; lemma pubescent over the back or sometimes on the margins only, 3- to 5-veined ..... *B. frondosus*
        7. Sheath auricles present at least on the lower leaves; spikelets 1.5–3 cm long; lemma pubescent all over the back and margins, 7-veined ..... *B. anomalus*

69. *Bromus anomalus* Rupr. ex E. Fourn., Mexic. Pl. 2: 126. 1886.

FIGURE 56

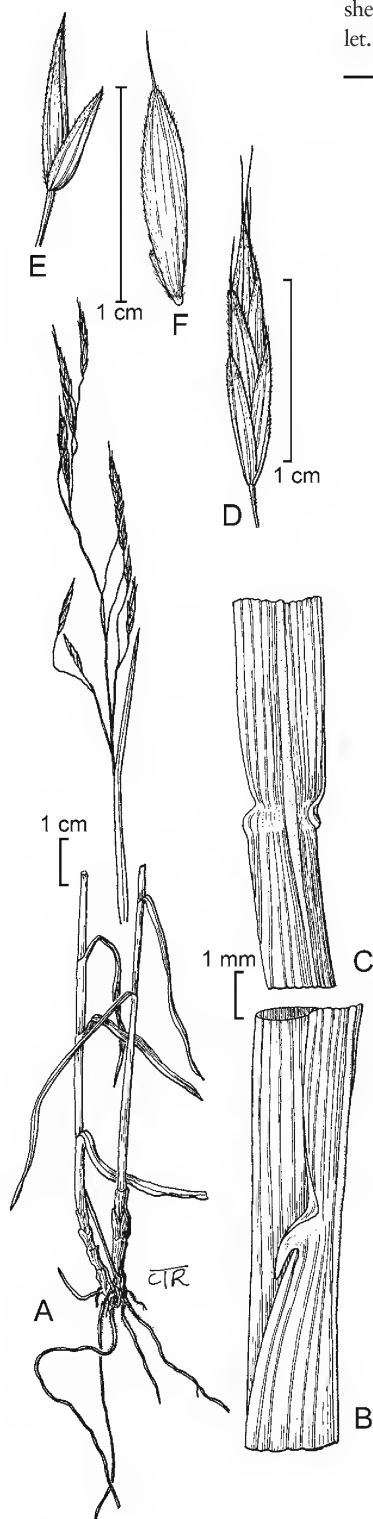
Perennial; not rhizomatous. Culms up to 110 cm tall, 2–4 mm thick, erect or ascending, bases often weakly to strongly decumbent, glabrous, scabrous or pubescent. Sheaths glabrous, pubescent, or pilose, hairs to 1.5 mm long, midrib distinctly narrowing below the collar; auricles usually present on the lower leaves, sometimes absent; ligules to 0.2–1.6 mm long, glabrous, erose-lacerate, ciliate; blades up to 35 cm long, 2–4 mm wide, flat, glabrous or weakly to moderate pubescent or pilose in both sides, hairs up to 1 mm. Panicles 10–18 cm long, open, nodding; branches ascending or spreading, scabrous, 1–5 spikelets per branch. Spikelets 1.5–2.8 cm long, 4- to 12-flowered, elliptic to lanceolate, terete to moderately laterally compressed; glumes usually pubescent, hairs up to 0.4 mm long, occasionally glabrous to puberulent, margins hyaline, green, purplish-green to purple along and between the veins; lower glumes 5–7.5(8.5) mm long, triangular or narrowly lanceolate, 1- or 3-veined; upper glumes 6–10.5 mm long, obovate-lanceolate, 3-veined, apex obtuse,

acute or mucronate, mucros up to 0.6 mm; lemmas 7–10 mm long, elliptic to lanceolate, rounded over the back, 5- to 7-veined, backs and margins pubescent, apex acute, obtuse or truncate, entire; awns 1.2–3 mm long, straight, arising less than 0.5 mm below the lemma apex, straight; paleas shorter and narrower than the lemmas, backs glabrous or pubescent, keels ciliate, cilia to 0.2 mm; anthers 1.5–3.2 mm long. Caryopsis 5–9 mm long, light brown.  $2n = 14$ .

This species is used by the Tarahumara (who refer to themselves as the Raramuri) people in the Sierra Madre Occidental (at Guachochi) to inoculate *tesquino* (sacred corn beer) and start the fermentation process by first chewing *Bromus anomalus* and then expectorating into a vat of corn mash. Author PMP was accompanied by G. A. Palma Aguirre and J. A. Bustillos Ramirez (two Raramuri) to a site at the edge of the Barranca Rio Verde (Peterson et al. 15372) to obtain a sample of this species.

**DISTRIBUTION AND HABITAT.** *Bromus anomalus* is a common native species that occurs in the mountains in pine-oak forests, on slopes, at forest margins, along creeks, and in ravines at 1,800–2,500 m. It extends from western Texas to Mexico, Guatemala, and Costa Rica.

FIGURE 56. *Bromus anomalus*. A. Habit. B. Auricle along margin at junction between sheath and blade. C. Leaf midrib distinctly narrowing below the collar, dorsal view. D. Spikelet. E. Glumes. F. Lemma. Drawn by Cindy Roché; copyright Utah State University.



**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Sierra La Campana, 10 km Pte. carr. [hwy] Panamericana, 19 Sep 73, pastizal con encino [pasture with oak], 1700 m, *Valdés-Reyna VR-336* (RELC). **Guachochi:** 20.3 mi S of Creel on road towards Rocheachic, 5 Oct 2000, pine forest, 2510 m, *P.M. Peterson & J. Cayouette 15367* (US); 9 mi S of Guachochi at edge of Barranca Rio Verde, 1 km along trail descending into canyon, 6 Oct 2000, pine forest, 2470 m, *P.M. Peterson & J. Cayouette 15372* (US); Cascada cusarare al W de Cusarare, 16 Sep 1983, bosque de pino-encino [pine-oak forest] *Cupresus*, 2190 m, *Tenorio & R. Torres 4396* (MEXU). **Guadalupey Calvo:** about 3 mi S of La Rocha, Sierra Mohinora, on bluffs along stream (tributary of Río del Soldado), 18 Oct 1959, 7000 ft, *Correll & Gentry 23233* (ENCB). **Guerrero:** on road between Tomochic and Bassaseachic, 20 mi E of jct w/ road S to San Juanito, 1.8 mi W of Aqua Caliente, 5 Oct 1986, 2000 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8875* (NMC); entre [between] La Junta & Temochi, 13 Aug 1976, bosque de pino, 2380 m, *S. González & J.M. Peña 612* (RELC). **Ignacio Madera:** Ciénega Ojo de la Vibora, ejido El Largo, 14 Aug 1990, bosque de pino, 2300 m, *A. Benítez 1905* (CIIDIR); Laguna de Babicora, 4 km al N del Ejido La Raíz, 10 Sep 1994, 2300 m, *G. Quintana & E. Estrada 3680* (NMC); 1.8 km al N de Parapetes, 27 Oct 77, bosque de pino-encino, 2200 m, *J.M. Peña JMP-788* (RELC); 10 km al SE de Madera, 5 Oct 74, bosque de pino-encino, 2000 m, *Valdés-Reyna VR-668* (RELC); Cienega ojo de la vibora, ejido el Largo, 14 Oct 1990, bosque de pino-encino con presencia de [with presence of] *Pinus durangensis* & *Quercus sideroxyla*, 2300 m, *O. Bravo 1905* (MEXU); Proximidad a la col. Chuichupa, 01 Sep 1990, pastizal & bosque [grove] de *Juniperus deppeana*, 2240 m, *A. Benitez 2180* (MEXU). **Ocampo:** Along drainage of Rio Candaseno at Cascada de Basaseachic, ca. 1 mi S of village of Basaseachic, 14 Oct 1984, 2000 m, *Spellenberg & M. Spellenberg 7930* (NMC); Parque Nacional "Cascada de Basaseachic," in the barranca [canyon] to W of falls, 4 Oct 1986, 1600 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8825* (NMC); Area of cascada de Basaseachic at the confluence of rio Basaseachic and rio Durazno, 2 mi S of village of Basaseachic, 17–20 Oct 1986, *Pinus-Cupressus* forest, 2000–2100 m, *G. Nesom & L. Vorobik 5705* (MEXU); Cascada de Basaseachic, 10 Oct 1981, bosque caducifolio [deciduous forest], 2500 m, *Fierros & Alvarez 1679* (MEXU). **Temosachi:** Nabogame, 6 Nov 1988, 1800 m, *Laferr. 2273* (NMC); 1043 (MEXU).

70. *Bromus carinatus* Hook. & Arn., Bot. Beechey Voy. 403. 1840.

Plants short-lived perennial; not rhizomatous. Culms 50–150 cm tall, usually less than 3 mm thick, erect, glabrous to pubescent below inflorescences. Sheaths mostly glabrous or pubescent to soft pilose, hairs up to 2 mm long, throats glabrous or pubescent; auricles absent; ligules (1)2–3(4) mm long, glabrous or pubescent, lacerate or erose; blades 10–30 cm long, 3–6(11) mm wide, flat, glabrous or pubescent on 1 or both surfaces, midveins narrowing beneath the collar. Panicles 5–30 cm long, open, branches erect, ascending or spreading, 4–22 cm long, pedicels longer or shorter than spikelets, glabrous, scabrous or pubescent, 1–4(9) spikelets per branch. Spikelets 2–4 cm long, 4- to 11-flowered, elliptic to lanceolate, strongly laterally compressed; glumes glabrous or pubescent, green to purple along and between the veins, margins hyaline; lower glumes 6.5–12 mm long, lanceolate, 3- to 7-veined, apex acute; upper glumes 9–15 mm

long, shorter than the lowest lemma, obovate-lanceolate, 5- to 9-veined, apex acute to acuminate; lemma 11–20 mm long, lanceolate, laterally compressed, strongly keeled distally, apex acute to obtuse, 7- to 9-veined, veins usually not raised or riblike, glabrous, scabrous, or pubescent, hairs sometimes restricted to margins, hairs up to 0.5 mm; awns 2–15 mm long, inserted 0–0.5 mm below the lemma apex, straight; paleas shorter than the lemmas, backs glabrous or pubescent, keels ciliate, cilia to 0.2 mm long; anthers 0.5–4.5 mm long. Caryopsis 9–11 mm long.  $2n = 56$ .

**DISTRIBUTION AND HABITAT.** *Bromus carinatus* is native from British Columbia to Saskatchewan and south to Mexico and Central America. Widespread in the pine forests of Mexico, in meadows, pastures, canyons, and on slopes at 1,500–3,200 m.

The great variation of this species in Mexico and Central America is discussed in Saarela et al. (2014), who recognized two varieties as follows (Barkworth et al., 2006).

#### KEY TO VARIETIES OF *BROMUS CARINATUS*

- 1. Most awns greater than 7 mm long ..... *B. carinatus* var. *carinatus*
- 1. Most awns less than 7 mm long ..... *B. carinatus* var. *marginatus*

#### *Bromus carinatus* var. *carinatus*.

Awns 7.1–10 mm long.

**DISTRIBUTION.** This variety is not as widespread as var. *marginatus*. It is known from Costa Rica, Honduras, and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** ejido San Ignacio Arareco, 19 Oct 1973, pine–oak forest, 7300 ft, *Bye* 5478 (MEXU). **Guachochi:** Cusarare S of Creel, 1 Sep 1973, *Bye* 4856 (MEXU); Cusarare near old church, 4 Aug 1974, 6900 ft, *Bye* 6771 (MEXU). **Madera:** 1.5 km de Col. Chuhuichupa, 13 Oct 1990, bosque [forest] de *Juniperus deppeana* & *Pinus engelmannii*, 2240 m, O. Bravo 1894 (MEXU); Ejido Madera, 8 Sep 1977, suelo prof. arcilloso [clayey soil], 2400 m, *Blanco* 06/77 (MEXU). **Riva Palacio:** Majalca, 25 Jun 1936, *LeSueur* 0154 (US); Majalca (Pilares), 12 Aug 1939, 2080 m, L. H. Harvey 1485 (ENCB, US).

#### *Bromus carinatus* var. *marginatus* (Nees ex Steud.) Barkworth & Anderton, Madroño 53(3): 240. 2006.

Awns 2–7 mm long.

**DISTRIBUTION.** Costa Rica, El Salvador, Guatemala, Honduras, and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer s.n. (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino–encino [pine–oak forest], 1891 m, P.M. Peterson & P. Catalán 17543 (CIIDIR, US). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22033 (US); 7 mi NE of San Rafael on road towards Creel, at Divisidero lookout, 5 Sep 2008, 2240 m, P.M. Peterson

& J.M. Saarela 22042 (US); Sánchez, 12 Oct 1910, *Hitchcock* 7704, 7718, 7719 (US); 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5869 (ENCB, US); Moist llano [flat] SW of Creel near San Ignacio, 17 Oct 1977, *Bye* & W.A. Weber 8279 (MEXU); **Carichic:** Rancho Nuevo a 50 km de San Juanito, 3 Aug 1979, bosque de encino, 2100 m, M. Siqueiros 184 (MEXU). **Casas Grandes:** W of Casas Grandes, 5 mi S of Hernández, 18 Sep 1960, 7000 ft, *Reeder*, C. Reeder & Soderstrom 3519 (ARIZ, ENCB, US). **Gómez Farías:** Laguna de Babicora, alreled [around] San Jose Babicora, 18 Aug 1994, 2200 m, G. Quintana & E. Estrada 3089 (NMC). **Guachochi:** in corn field south of Creel, 11 Aug 1971, 8100 ft, *Bye* 1816 (MEXU); 12.1 mi W of San Juanito on road towards Baquiriachic, 5 Oct 2000, bosque de pino, 2530 m, P.M. Peterson & J. Cayouette 15357 (US); 2.3 mi W of San Juanito on road towards Baquiriachic, 5 Oct 2000, P.M. Peterson & J. Cayouette 15359 (US); Cusarare, south of Creel–La Bufa, 11 Aug 1972, pastizal [pastureland], 7000 ft, *Bye* 2736 (MEXU). **Guadalupe y Calvo:** E slopes of Sierra Mohinora, 17 Oct 1959, *Correll* & *Gentry* 23203 (US); near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20036, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US); W slopes of Sierra Mohinora, 3008 m, 13 Sep 2006, P.M. Peterson, F. Sánchez Alvarado & E.P. Gómez Ruíz 20054 (CAN, US). **Madera:** Rio Aros, 23 Aug 1937, *LeSueur* 0212 (US); Rancho La Ciénega, ejido El Largo, 31 Aug 1990, bosque de pino, 2500 m, O. Bravo 1399 (CIIDIR, MEXU); Proximidad a la Col. Chuichupa, 1 Sep 1990, pastizal & bosque [grove] de *Juniperus*, 2240 m, A. Benítez 2180 (CIIDIR); Camino Nicolas Bravo–Las Varas, 18 Aug 1994, 2150 m, G. Quintana & E. Estrada 2998 (NMC); Laguna de Babicora, alrededores de [around] Nicolás Bravo, 18 Aug 1994,



2200 m, *Quintana, Lebgue & Estrada* 3119 (NMC). **Ocampo:** Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8702 (NMC). **Práxedes G. Guerrero** (San Ignacio): a 2 km al S del poblado del mismo nombre [village of the same name], Rancho Escuela de la Univ. Autónoma de Cd. Juárez, 18 Mar 1995, 1090 m, *R. Corral, P. Olivas & E. Pérez RCD6030* (UACJ). **Temosachi:** Yepáchic, 3 Sep 1971, grows in profusion in abandoned fields near Yepáchic, 2100 m, *C.W. Pennington* 4 (MEXU).

71. *Bromus catharticus*\* Vahl, *Symb. Bot.* 2: 22. 1791.

FIGURE 57

Annual, biennial, or short-lived perennial; not rhizomatous. Culms 20–120 cm tall, 2–4 mm thick, erect or decumbent, glabrous below inflorescences. Sheaths pubescent or pilose, hairs up to 1.2 mm; auricles absent; ligules 2–5(6) mm long, glabrous or pubescent, lacerate; blades 4–30 cm long, 2–10 mm wide, flat, sometimes conduplicate, glabrous to pubescent on 1 or both surfaces. Panicles 8–30 cm long, usually open, nodding, branches erect to ascending, scabrous, up to 5 spikelets per branch. Spikelets 1.5–3(3.5) cm long, elliptic to lanceolate, 4- to 11-flowered, strongly laterally compressed; glumes glabrous, scabrous, or pubescent, green to purplish-green along and between the veins, margins hyaline, midveins glabrous to scabrous distally, apex acute to obtuse; lower glumes 6–12 mm long, lanceolate, 3- to 7-veined; upper glumes 8–14 mm long, ovate-lanceolate, 9(11)-veined, shorter than the lowest lemma; lemmas 10–20 mm long, obovate-lanceolate, strongly keeled, apex acute to obtuse, 7- to 11-veined, veins usually raised and riblike, green, greenish-yellow or purplish-green along and between the veins, glabrous or scabrous, margins hyaline; awns 0.5–3.5(4) mm long, inserted up to 0.5 mm below lemma apex, straight; paleas shorter than the lemmas, backs glabrous, strongly keeled; anthers 0.5–1.3 mm long; caryopsis 8–10 mm long, light brown.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Bromus catharticus* is native to South America. It has been widely introduced in the southern United States and Mexico. It usually grows on disturbed habitats at 2,200–2,600 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Casas Grandes: camino [road] al Willis rancho Mesa de la Avena, 29 May 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], 2570 m, *R. Fierros* 1270 (MEXU).

72. *Bromus frondosus* (Shear) Wooton & Standl., New Mexico Agric. Exp. Sta. Bull. 81: 144. 1912.

FIGURE 58

Perennial; not rhizomatous. Culms 54–84 cm tall, 2–4 mm thick, erect to spreading; nodes 3–5, glabrous below the inflorescences, rarely pubescent. Sheaths sparsely to densely pilose, hairs up to 1.2 mm; auricles absent; ligules 0.5–2 mm long, glabrous; blades 10–29 cm long, 4–6 mm wide, flat, often glaucous, usually

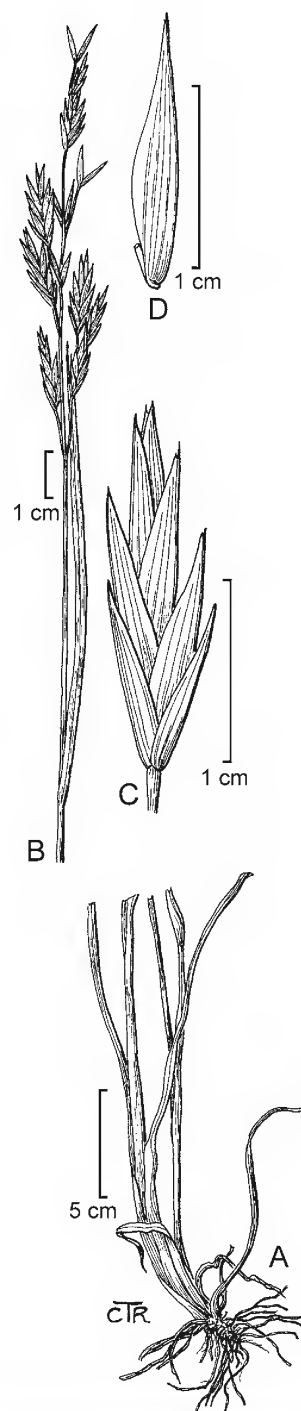


FIGURE 57. *Bromus catharticus*. A. Habit. B. Culm and inflorescence. C. spikelet. D. Lemma. Drawn by Cindy Roché; copyright Utah State University.

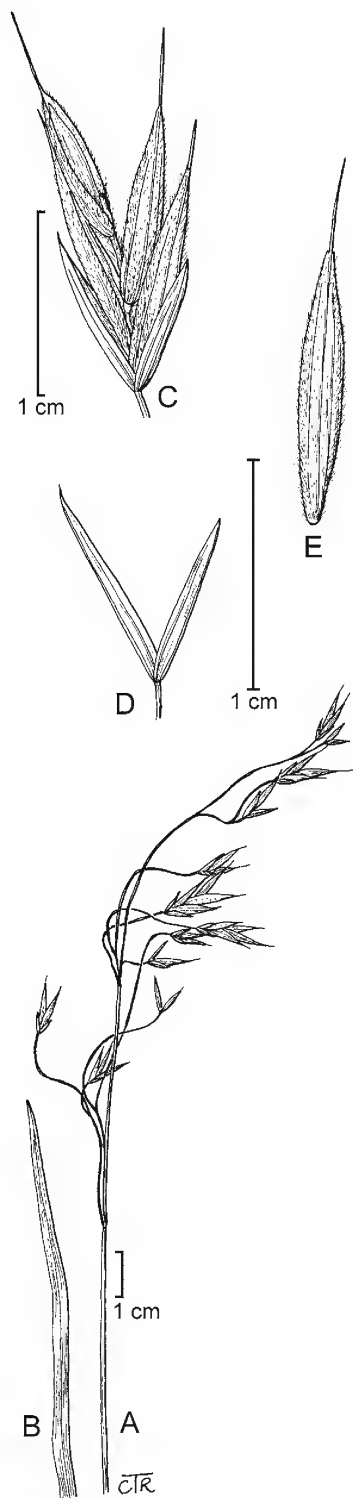


FIGURE 58. *Bromus frondosus*. A. Culm and inflorescence. B. Leaf blade. C. Spikelet. D. Glumes. E. Lemma. Drawn by Cindy Roché; copyright Utah State University.

glabrous, sometimes pubescent, hairs up to 1 mm. Panicles 9–13 cm long, 3–6 cm wide, open, nodding, branches ascending to spreading, 0.5–5 cm long, shorter or longer than spikelets, scabrous, 1–4 spikelets per branch. Spikelets 1.6–3 cm long, 7- to 9 flowered, elliptic to lanceolate, terete to moderately laterally compressed; glumes green along and between the veins, glabrous, scabrous or minutely pubescent, hairs when present sometimes restricted to the hyaline margins; lower glumes 6–8.5 mm long, 0.6–1 mm wide, lanceolate, 3-veined, apex acute; upper glumes 8–10 mm long, 0.9–1.3 mm wide, oblong-ovate, 3-veined, apex acute or mucronate, mucros up to 1 mm; lemmas 9–12 mm long, 1.5–2.5 mm wide, elliptic to lanceolate, rounded over the backs, apex truncate, 5- to 7-veined, green along and between the veins, backs glabrous or sparsely to densely pubescent, margins pubescent on the lower  $\frac{1}{3}$  to  $\frac{1}{2}$ , hairs up to 1 mm long; awns 3.5–6 mm long, straight, arising 0–0.5 mm below lemma apex, straight; paleas shorter than the lemmas, 9–10 mm long, backs glabrous or pubescent; anthers 1.5–3.5 mm long. Caryopsis 6–8 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Bromus frondosus* is native and grows in open woods and on rocky slopes associated with pine forests at 1,300–2,750 m. Its range extends from Colorado, Arizona, and New Mexico into northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** Rancho el Peñasco km 150 carr [hwy] Chihuahua–Cd. Juárez, 9 Aug 1979, pastizal mediano arbosufrutecente, 1720 m, M. Siqueiros 336 (MEXU); 23 mi ENE of Villa Ahumada in NW canyon of Sierra la Alcaparra NE of Rancho El Palmar, 12 Sep 1973, bosque de encino [oak forest], 1500 m, J. Henrickson 12864 (MEXU); SW slope of Sierra de la Ranchería (on Rancho Candelaria) from the top down to a marble quarry at base, 29 Oct 1972, matorral inerme [unarmed small-leaved scrub], 1500–2180 m, T.L. Wendt, F. Chiang & M.C. Johnston 9949 (MEXU). **Balleza:** Creel, km 90 a Chihuahua, La Mesa de Yeguachi, 27°47.155'N, 107°38.611'W [27.78583°N, 107.643611°W], 2248 m, 13 Sep 2003, R. Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio 32541 (US); 34 mi W of Balleza towards Guachochi, 2500, P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13539 (US); 19.6 km W of Balleza and 74.2 km E of Guachochi, 18 Sep 1991, 2120 m, P.M. Peterson, Annable & Valdés-Reyna 10753 (CIIDIR, US). **Bocoyna:** Bocoyna, La Junta, 13 Sep 2003, R. Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio 32463 (US); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2350 m, P.M. Peterson, Annable & Y. Herrera 8002 (US); 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22028 (US); Sánchez, 12 Oct 1910, Hitchcock 7665 (US). **Camargo:** Sierra de los Organos, 8 Sep 1937, LeSueur 0211 (US). **Guachochi:** Guachochi, Norogachi, planicie [plain], 16 Sep 2003, R. Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio 32771 (US); 12.1 mi W of San Juanito on road towards Baquiriachic, 5 Oct 2000, bosque de pino [pine forest], 2530 m, P.M. Peterson & J. Cayouette 15358 (US); 20.3 mi S of Creel on road towards Rocheachic, 6 Oct 2000,

bosque de pino, 2510 m, *P.M. Peterson & J. Cayouette* 15368 (US). **Guerrero:** 8 mi N of Santo Tomas, 28.81°N, 107.5667°W, 8 Oct 1953, 2010 m, *Reeder & C. Reeder* 2625 (US). **Madera:** near Col. Garcia in the Sierra Madre, 14 Sep 1899, 2300 m, *C.H.T. Townsend & C.M. Barber* 327 (NMC, US). **Ocampo:** 16.7 mi W of Baquiriachic on hwy 16 towards Maycoba, 4 Oct 2000, bosque de pino, 2000 m, *P.M. Peterson & J. Cayouette* 15353 (US). **Riva Palacio:** Majalca, 18–20 Aug 1935, *LeSueur Mex-030* (US); Majalca, NW Chihuahua, 29 Sep 1934, 2200 m, *Pennell* 19299 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7969 (ENCB, US). **Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, pine woods, 2400 m, *P.M. Peterson & R.M. King* 8154 (ENCB).

73. *Bromus japonicus*\* Thunb., Syst. Veg. (ed. 14) 119. 1784.

FIGURE 59

Annual. Culms (22)30–70 cm tall, erect or ascending. Sheaths usually densely pilose; upper sheaths sometimes pubescent or glabrous; ligules 1–2.2 mm long, pilose, obtuse, lacerate; blades 10–20 cm long, 2–4 mm wide, usually pilose on both surfaces. Panicles 10–22 cm long, 4–13 cm wide, open, nodding; branches usually longer than the spikelets, spreading to ascending, slender, flexuous, somewhat drooping, sometimes sinuous, often with more than 1 spikelet. Spikelets 20–40 mm long, lanceolate, terete to moderately laterally compressed; florets 6–12, bases concealed at maturity; rachilla internodes concealed at maturity; glumes smooth or scabrous; lower glumes 4.5–7 mm long, 3- to 5(7)-veined; upper glumes 5–8 mm long, 7- to 9-veined; lemmas 7–9 mm long, 1.2–2.2 mm wide, lanceolate, coriaceous, smooth proximally, scabrous on the distal ½, obscurely (7)9-veined, rounded over the midvein, margins hyaline, 0.3–0.6 mm wide, obtusely angled above the middle, not inrolled at maturity, apex acute, bifid, teeth shorter than 1 mm; awns 8–13 mm long, strongly divergent at maturity, sometimes straight, twisted, flattened at the base, arising 1.5 mm or more below the lemma apex; anthers 1–1.5 mm long. Caryopsis equaling or shorter than the paleas, thin, weakly inrolled or flat.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Bromus japonicus* grows in fields, waste places, and roadways. It is native to central and southeastern Europe and Asia and is distributed throughout much of the United States and southern Canada with one record from the Yukon Territory.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Rancho Experimental La Campana, Chihuahua, 14 May 1977, 1540 m, *S. González* 838 (ENCB); Rancho



FIGURE 59. *Bromus japonicus*. A. Habitat. B. Ligule. C. Culm and inflorescence. D. Spikelet. E. Glumes. F. Lemma. Drawn by Cindy Roché; copyright Utah State University.

Experimental La Campana–Chihuahua, 28.63°N, 106.08°W, 1540 m, 5 Aug 1977, S. González s.n. (ANSM); Rancho Experimental La Campana, 82 kms al norte de la Cd. de Chihuahua, 1500 m, 26 August 1978, s.c. (MEXU).

74. *Bromus richardsonii* Link, Hort. Berol. 2: 281. 1833. *Bromus mucroglumis* Wagnon.

FIGURE 60

Perennial; not rhizomatous. Culms 50–110(145) cm tall, erect to spreading; nodes (3)4–5(6), usually glabrous, sometimes pubescent; internodes usually glabrous. Basal sheaths often retrorsely pilose; culm sheaths glabrous, often tufted-pilose near the auricle position, midrib of the culm leaves not abruptly narrowed just below the collar; auricles absent; ligules 0.4–2 mm long, glabrous, rounded, erose, ciliolate; blades 10–35 cm long, 3–12 mm wide, flat, glabrous. Panicles 10–20(25) cm long, open, nodding; branches ascending to spreading or drooping, filiform. Spikelets 15–25(40) mm long, elliptic to lanceolate, terete to moderately laterally compressed, with (4)6–10(15) florets; glumes usually glabrous, sometimes pubescent; lower glumes 7.5–12.5 mm long, 1(3)-veined; upper glumes 8.9–11.3 mm long, 3-veined, often mucronate; lemmas 9–14(16) mm long, elliptic, rounded over the midvein, margins more or less densely pilose on the lower  $\frac{1}{2}$  or  $\frac{3}{4}$ , lower lemmas in a spikelet glabrous across the back, uppermost lemmas with appressed hairs on the back, apex obtuse, entire; awns (2)3–5 mm long, straight, arising less than 1.5 mm below the lemma apex; anthers 1.6–2.7 mm long.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Bromus richardsonii* grows in meadows and open woods in the upper montane and subalpine zones at about 2,000–4,000 m in the southern Rocky Mountains and at lower elevations northward. Its range extends from southern Alaska to southern California and northern Baja California, Mexico. *Bromus ciliatus* L., sometimes assigned as occurring in Mexico (Soderstrom and Beaman 1968), is distributed across southern Canada and the United States, except the south-central and southeastern United States (Pavlick and Anderton 2007); it is not known from Mexico (Saarela et al., 2014).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 15 mi E of El Vergel on road to Parral, 21 Oct 1959, Correll & Gentry 23255 (US); 15.2 mi E of Ocote on hwy 24 towards El Vergel, 26.1392°N, 106.66°W, 2580 m, 14 Sep 2006, P.M. Peterson, F. Sánchez-Alvarado, & E.P. Gómez-Ruiz 20064 (US). **Batopilas:** Urique, a 8.8 kms al N de Cuiteco, por la barranca rumbo [through the canyon heading] a San Rafael, 27°26'10.9"N, 108°00'04.1"W [27.43639°N, 108.00111°W], 1740 m, 22 Sep 2002, P. Tenorio, G. Morales & J. Rodríguez 22111 (US). **Bocoyna:** Bocoyna, Colecta 3, Rancho, 10 Sep 2003, Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio 3206 (US); entronque carr. [junction hwy] Creel, entrada [entry] a Bocoyna, Ldera S Rancho Cima, Rancho Lucía, 27°41.428'N, 107°24.699'W [27.69056°N, 107.41167°W], 7538 ft, 20 Sep 2003, Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio

3206 (US); Sánchez, 12 Oct 1910, Hitchcock 7708, 7713 (US); 34.4 mi NW of San Juanito on road towards Baquiriachic, 4 Oct 2000, bosque de pino [pine forest], 2800 m, P.M. Peterson & J. Cayouette 15356 (US). **Casas Grandes:** Strawberry Creek, NE of Col. Pacheco, 22–24 Sep 1934, Pennell 19171 (US); W of Casas Grandes, 3 mi E of Cuesta Blanca, 4 Sep 1958, Reeder & C. Reeder (US). **Chihuahua:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, P.M. Peterson & Annable 12576 (US). **Gomez Farías:** hills S of Laguna de Bavicora, 18 airline km SSW of Gomez Farias, 28 Aug 1975, oak woodland, 2250 m, N.H. Holmgren & T.K. Lowrey 8028 (MEXU). **Guachochi:** poblado [village] de Magurichi, 2a colecta comida [collect food], 24 Oct 2003, R. Bye, M. Mendoza, G. Morales, J. Rodríguez & M. Hilerio 33069 (US); 5.5 mi E of Cieneguita de Barranca on road towards Creel, 5 Sep 2003, bosque de pino, 2160 m, P.M. Peterson & P. Catalán 17698 (US); 5.8 mi N of Creel on road (Hwy 25) towards San Juanito, 2480 m, P.M. Peterson & J. Cayouette 15363 (US); Approx. 22.5 mi NE of Cieneguita de Barranca on road to Creel, 5 Sep 2003, bosque de pino, 2160 m, P.M. Peterson & P. Catalán 17697 (US); 48.6 mi S of Creel on road towards Rocheachic, 5 Oct 2000, bosque de pino, 2630 m, P.M. Peterson & J. Cayouette 15371 (US); Arroyo Guachimuchi, ca. 15 km of Norogachi, 18 Oct 2006, pino-encino [oak], 2146 m, Bye et al. 34824 (MEXU); 5 km antes del entronque [before the junction] a la Bufo carr. Guachochic–Creel, 24 Sep 1981, 2500 m, M.E. Siqueiros 1614 (MEXU). **Guadalupe y Calvo:** N side of cerro Mohinora ca 13 mi SW of Guadalupe y Calvo, 20 Aug 1988, open pine-fir Woods with scattered spruce, 2950 m, G. Neson & A. McDonald 6474 (MEXU); near Cumbre Mohinora, Sierra Mohinora, 25.95°N, 107.05°W, 3250–3300 m, 13 Sep 2006, P.M. Peterson 20047, F. Sánchez-Alvarado, & E.P. Gómez-Ruiz (US). **Guazapares:** eastern drainage of Barranca de Chinipas, NW of San Rafael, 11 Nov 1973, 850 m, Bye 5860 (MEXU). **Madera:** Arroyo de la Quinta, ejido “El Largo”, 30 Aug 1990, bosque de pino, 2340 m, A. Benítez 2087 (CIIDIR-MEXU); 2100 m, 13 Oct 1990, A. Benítez 2837 (MEXU). **Namiquipa:** Aprox. 39 km, carr. Chihuahua–Namiquipa, 24 Sep 1997, bosque de encino, 2300 m, M.A. Vergara 176 (MEXU). **Ocampo:** 16.7 mi W of Baquiriachic on hwy 16 towards Maycoba, 4 Oct 2000, bosque de pino, 2000 m, P.M. Peterson & J. Cayouette 15354, 15355 (US); near Mirador de Cascada Basaseachic, 28.1647°N, 108.2°W, 2022 m, 7 Sep 2008, P.M. Peterson & J.M. Saarela 22084 (US).

75. *Bromus tectorum*\* L., Sp. Pl. 1: 77. 1753.

FIGURE 61

Plants annual. Culms 5–80 cm tall, solitary or loosely tufted, erect or ascending, nodes, as well as below inflorescences, glabrous or minutely pubescent. Sheaths glabrous or variously pubescent, hairs stiff and up to 0.5 mm or soft and wavy up to 1 mm long; ligules (1)2–3 mm long, erose-lacinate; blades 1.3–1.4 cm long, 1–5 mm wide, flat, sparsely to densely pubescent adaxially, puberulent abaxially. Panicles 4–22 cm long, 1–13.5 cm

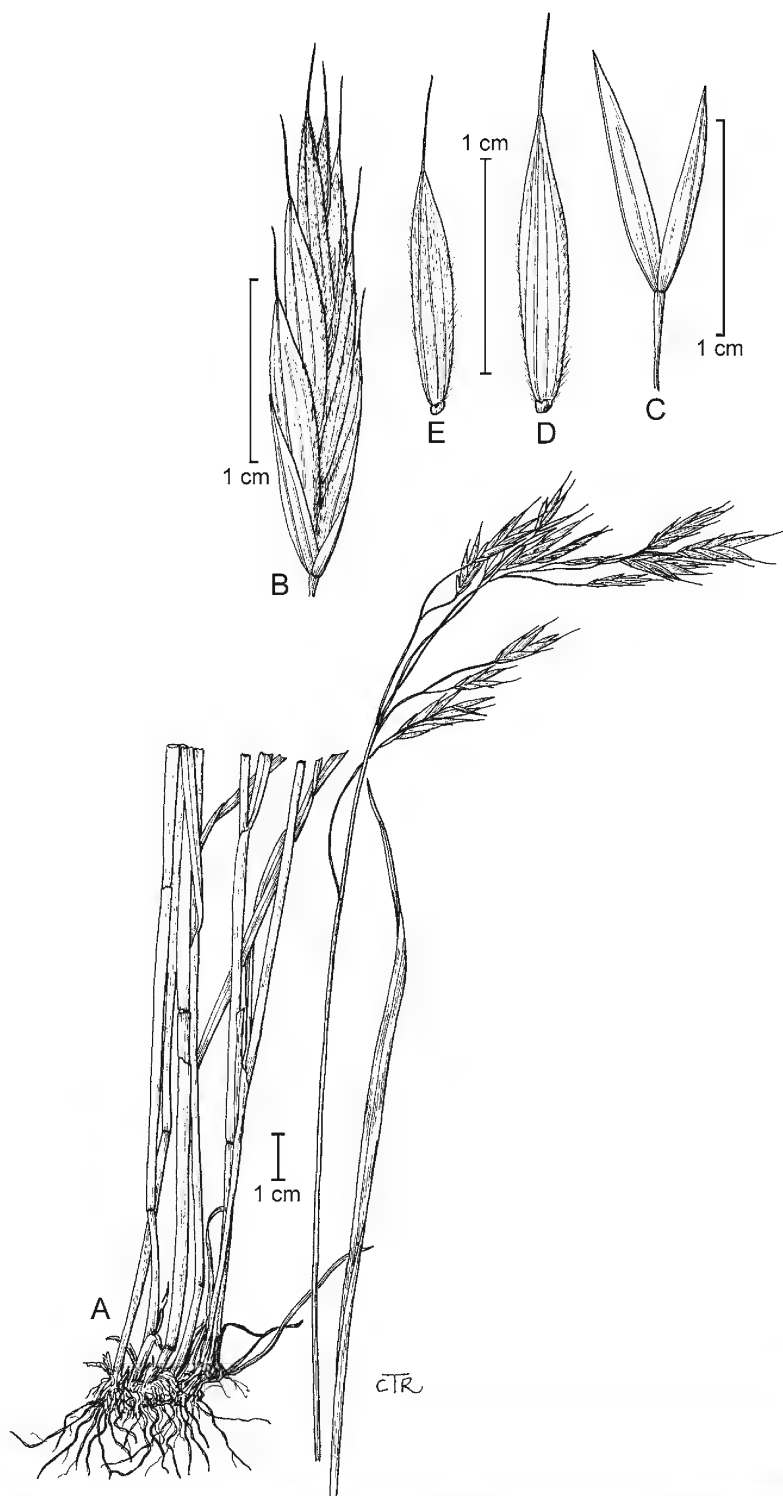


FIGURE 60. *Bromus richardsonii*. A. Habit. B. Spikelet. C. Glumes. D. Lower lemma. E. Upper lemma. Drawn by Cindy Roché; copyright Utah State University.

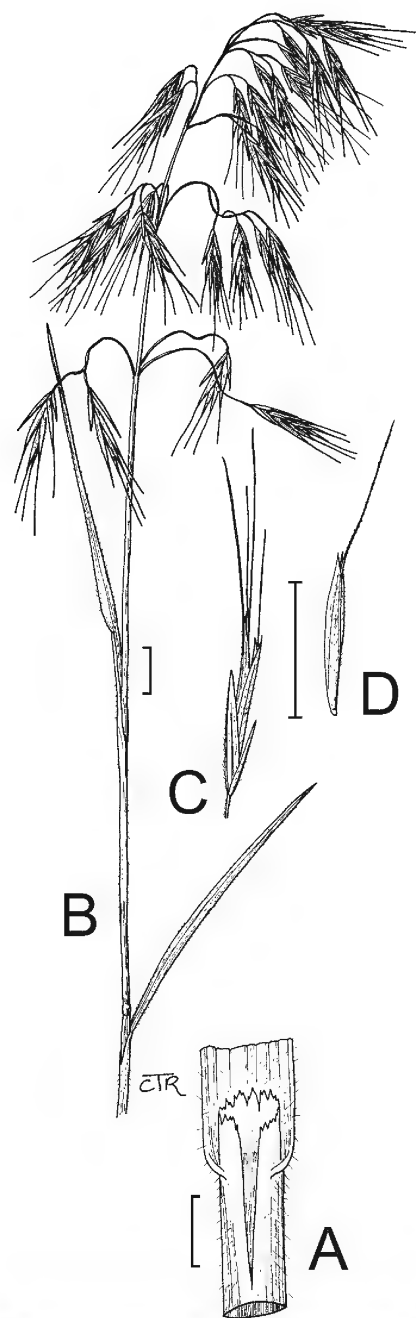


FIGURE 61. *Bromus tectorum*. A. Ligule. B. Culm and inflorescence. C. Spikelet. D. Lemma. Drawn by Cindy Roché; copyright Utah State University.



wide, condensed and erect when young, becoming lax and nodding, sometimes reduced to a few spikelets, branches spreading to drooping, 0.4–4 cm long, usually longer than spikelets, 1-sided, often sinuous, scabrous to densely pubescent, 1–14 spikelets per branch. Spikelets 1.5–2(2.5) cm long (2.5–3.5 cm including awns), 3- to 6(8)-flowered, linear-elliptic to cuneate, moderately laterally compressed, rachilla sometimes visible at maturity; glumes green to purplish-green, glabrous or minutely pubescent in a line inside the hyaline margins, the apex bifid, the cleft 0.1–0.5 mm deep; lower glumes 4–9 mm long, linear-lanceolate, 1(3)-veined, occasionally minutely awned, awn to 1.1 mm long, upper glumes 7–13.5 mm long, elliptic-lanceolate, 3(5)-veined, lanceolate, awned; lemma 9–13.5 mm long, lanceolate, rounded over the backs, 7-veined, apex bifid, the teeth 1–3 mm long, awn 8–18 mm long, arising 1–2.5 mm below the lemma apex, straight; palea 7–8.7 mm long, back glabrous and keels ciliate; anthers 0.5–0.9 mm long. Caryopsis 7–8 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Bromus tectorum* was introduced to Mexico; it grows in arroyos and meadows in conifer forests. It is common in northern Baja California, and a few other collections are from cultivated gardens in Chihuahua, Coahuila, and Sonora; apparently it has not spread from there.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Maleza en jardín de observación [weed in observation garden] en el Rancho Experimental La Campana, 12 Apr 1975, Valdés-Reyna VR877 (RELIC).

### *Calamagrostis* Adans.

Plants rough, perennial; caespitose or rhizomatous. Culms simple, slender; ligule a membrane; blades linear, firm, flat or involute. Inflorescence a terminal panicle, spread or contracted. Spikelets laterally compressed, 1 floret or rarely 2 florets, disarticulating above the glumes; glumes longer than the florets, equal or subequal, acute or acuminate, 1- to 3-veined; lemma generally 5-veined, membranous, the apex truncate to 2-toothed or shortly 4-awned, awn emerging from the back, the awn straight or geniculate, often twisted, insert near the base; callus obtuse, rarely recurved or elongated, generally pilose, the pubescence can be very short to long and copious; palea slender, shorter than the lemma; rachilla prolongate behind the palea as a naked bristle or pilose; stamens 1–3. Caryopsis with solid endosperms, often liquid or soft.  $x = 7$ .

*Calamagrostis* has approximately 150 species of temperate and cold regions of the world.

76. *Calamagrostis pringlei* Scribn. ex Beal, Grass. N. Amer. 2: 345. 1896.

Perennial; rhizomatous. Culms 50–70(80) cm tall, solitary or mat-forming, erect, glabrous, rhizomes crawling. Sheaths glabrous to sparsely pilous or scabrous when young; ligules 1–4 mm

long, membranous, irregularly toothed; blades 10–15 cm long, 1–4 mm wide, flat, involute when dry, pilose in both surfaces. Panicles 6–18 cm long, narrow, sometimes nodding; branches ascending, naked near base or with spikelets at the base, green with pinkish spots, axis glabrous or scaberulous, capillary; glumes 4.5–5 mm long, narrow subequal, acuminate, 1-veined, scabrous; lemma 4.5–5 mm long, soft and scaberulous, almost acuminate, awn 4–6 mm long, slender, geniculate, frequently twisted on the base, scabrous distally, exserted; callus with hairs 0.8–1 mm long; rachilla 1.5–2 mm long, pubescent, the hairs 1–2 mm long.

**DISTRIBUTION AND HABITAT.** *Calamagrostis pringlei* grows in oak forests and rocky cliffs with *Pinus*, *Pseudotsuga menziesii* (Mirb.) Franco, *Cupressus*, *Arctostaphylos pungens* Kunth, and *Brickellia*; it occurs in Aguascalientes, Chihuahua, Coahuila, Durango, Hidalgo, Michoacán, Nuevo León, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** Rio Verde crossing, 21 mi SW of El Vergel, 14 Sep 2006, 2330–2360 m, P.M. Peterson, Sánchez Alvarado & Gómez Ruíz 20072 (US). **Guerrero:** Sierra Madre, 1 Oct 1887, C.G. Pringle 1422, 1704 (US) Isotype; On road between Tomochic and Bassaseachic, 20 mi E of jct w/ road S to San Juanito, 1.8 mi W of Aqua Caliente, 5 Oct 1986, 2000 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8878 (NMC).

### *Cenchrus* L.

Annual or perennial. Culms 5–200 cm tall, erect or decumbent, usually geniculate; nodes and internodes usually glabrous. Sheaths open, usually glabrous; ligules membranous, ciliate, cilia as long as or longer than the basal membrane; blades flat or folded, margins cartilaginous, scaberulous. Inflorescences terminal, spike-like panicles of highly reduced branches termed *involucres* (“burs”); involucre consisting of 1–2 series of many, stiff, partially fused, usually retrorsely scaberulous to strigose, sharp bristles surrounding, sometimes almost concealing, 1–4 spikelets; outer (lower) bristles, if present, in 1 or more whorls, terete or flattened; inner (upper) bristles usually strongly flattened, fused at least at the base and forming a disk, frequently to more than ½ their length and forming a cupule; disarticulation at the base of the involucre. Spikelets sessile, with 2 florets; lower florets usually sterile; upper florets bisexual. Lower glumes ovate, scarious, glabrous, 1-veined, acute to acuminate; upper glumes and lower lemmas ovate, 3- to 9-veined; lower paleas equaling the lemmas, tawny or purplish; upper lemmas and paleas subequal, indurate, ovate, obscurely veined, acuminate. Caryopsis obtriloid.  $x = 17$ .

*Cenchrus*, as now circumscribed (synonym = *Pennisetum* Rich.), includes about 120 primarily tropical species, some of which are readily (and painfully) recognized by their spiny involucre (Soreng et al., 2017b). Many species in Mexico are considered to be undesirable weeds.

KEY TO SPECIES OF *CENCHRUS*

1. Involucres of spines or stiff bristles united at the base or halfway to the apex, usually retrorse roughened, the early ones antrorse scabrous.
  2. Spines or bristles united only below the inferior  $\frac{1}{5}$  (almost at the base), forming a soft involucre, ciliate or feathery, not spinose, with a small disk and forming a low, deep cupule; perennial.
    3. Bristles retrorsely scabrous, cylindric, all similar but the internal longer and the external gradually smaller . . . . . *C. myosuroides*
    3. Bristles antrorsely bearded.
      4. Bristles soft and densely pilose (feathery), the innermost up to 1.5 times longer than the rest; spikelets 2.5–4.8 mm long; inflorescences 1–2.5 cm wide . . . . . *C. ciliaris*
      4. Bristles somewhat indurate (especially the innermost ones), sparsely pilose but never feathery, the innermost ones 2 or more times longer than the rest; spikelets 5–6(9) mm long; inflorescences 1–1.5 cm wide . . . . *C. multiflorus*
  2. Spines or bristles united more or less halfway, forming a hardened involucre; annual and/or biannual.
    5. Involucre of united spines, flattened and wider basally, in several concentric whorls, without additional bristles . . . . . *C. spinifex*
    5. Involucre with a row of basal bristles, slender, numerous . . . . . *C. echinatus*
1. Involucres of free bristles (or somewhat united at the base), often feathery.
  6. Plants stoloniferous; culms prostrate 3–45 cm long; panicles axillary, partially or wholly hidden in the leaf sheaths at maturity, the rachises flattened in cross section, with 1–6 involucres; spikelets 10–22 mm long, bristles mostly shorter than the spikelet . . . . . *C. clandestinus*
  6. Plants not stoloniferous; culms erect, 30–300 cm tall; panicles terminal or terminal and axillary, fully exerted at maturity, the rachises terete, with 10 to many involucres; spikelets 2.5–12 mm long, the majority of the bristles as long as or longer than the spikelets.
    7. Inflorescences 15–30 mm wide; bristles ciliate . . . . . *C. polystachios*
    7. Inflorescences 3–15 mm wide; bristles ciliate, glabrous or scabrous.
      8. Annual plants; caryopsis obovoid, exposed between gaping lemma and palea; blades 50–100 cm long, cordate at the base . . . . . *C. americanus*
      8. Perennial plants; caryopsis ellipsoid, permanently hidden by the lemma and palea; blades 20–60 cm long, never cordate at the base.
        9. Bristles mostly shorter than spikelets; spikelets 6–7 mm long . . . . . *C. durus*
        9. Bristles mostly longer than spikelets; spikelets 4.5–6.5 mm long . . . . . *C. michoacanus*

77. *Cenchrus americanus*\* (L.) Morrone, Ann. Bot. (Oxford), n.s. 106: 127.

*Pennisetum glaucum* (L.) R. Br.

FIGURE 62

Annual. Culms 150–300 cm tall, erect, robust, branching; nodes bearded. Sheaths glabrous or pubescent; ligules 2–5 mm long, a fringe of hairs; blades 50–100 cm long, 8–70 mm wide, cordate on the base, flat. Inflorescence a spiciform panicle, terminal, 4–200 cm long, 8–60 mm wide, fully exerted from the sheaths, erect; rachises terete, densely pubescent. Involucres 33–160 per cm; involucre axes 1–28 mm long, persistent, with 1–9 spikelets; outer bristles 44–131, 0.5–6 mm; inner bristles 6–19, 4–6 mm long, plumose; primary bristles 5.5–6.3 mm long, ciliate, sometimes noticeably longer than the other bristles. Spikelets 3–6 mm long; pedicels 0.6–1.8 mm long; lower glumes absent or to 1.5 mm long, veinless; upper glumes 0.5–2.5 mm long, 3- to 5-veined; lower florets staminate or sterile; lower lemmas 1.5–6 mm long, glabrous, 3- to 7-veined, margins ciliate; lower paleas vestigial or fully developed, margins ciliate; anthers 2.2–2.5 mm long, penicillate; upper florets coriaceous, shiny; upper

lemmas 4.3–7 mm long, 5- to 7(9)-veined, margins ciliate; upper paleas 3.4–3.9 mm long, pubescent, at least near the base, margins ciliate; anthers 2–2.2 mm long, penicillate. Caryopsis 2–5.5 mm long, 1.6–3.2 mm wide, obovoid, exposed between gaping lemma and palea at maturity.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus americanus*, a native of Asia, is cultivated in the United States for grain, forage, and birdseed; reported wild from Chihuahua, Mexico but not seen.

78. *Cenchrus ciliaris*\* L., Mant. Pl. 302. 1771. *Pennisetum ciliare* (L.) Link, Hort. Berol. 1: 213 1827.

FIGURE 63

Perennial; emerging from a hard and nodose crown or short rhizomes. Culms 25–100 cm long, erect, branched, glabrous. Sheaths compressed, glabrous or pilose near the throat, margins hyaline; ligule 0.5–2.5 mm long, pilose; blades 3–24 cm long, 2–8 mm wide, flat, scabrous to pilose, narrowing toward the apex. Inflorescence 2–12 cm long, 1–2.5 cm wide, rachis flexible and scabrous, internodes 0.8–2 mm; involucres 9–15 mm

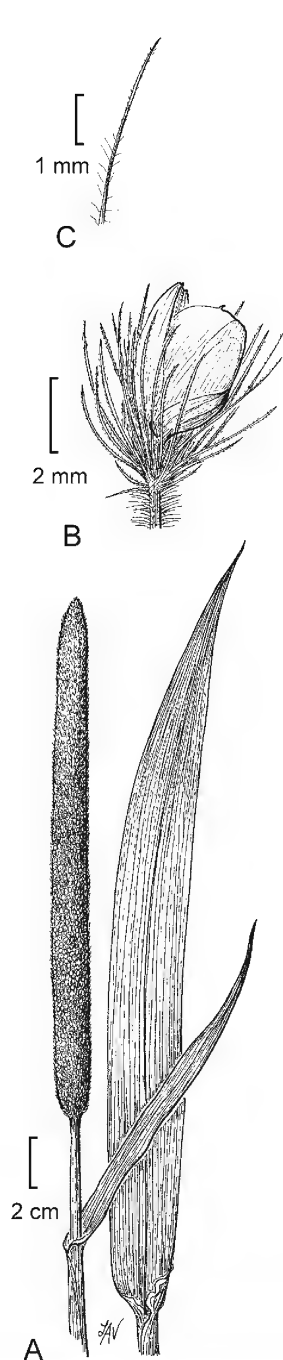


FIGURE 62. *Cenchrus americanus*. A. Inflorescence and leaf blade. B. Spikelet involucre. C. Close-up of primary bristle. Drawn by Linda Ann Vorobik; copyright Utah State University.

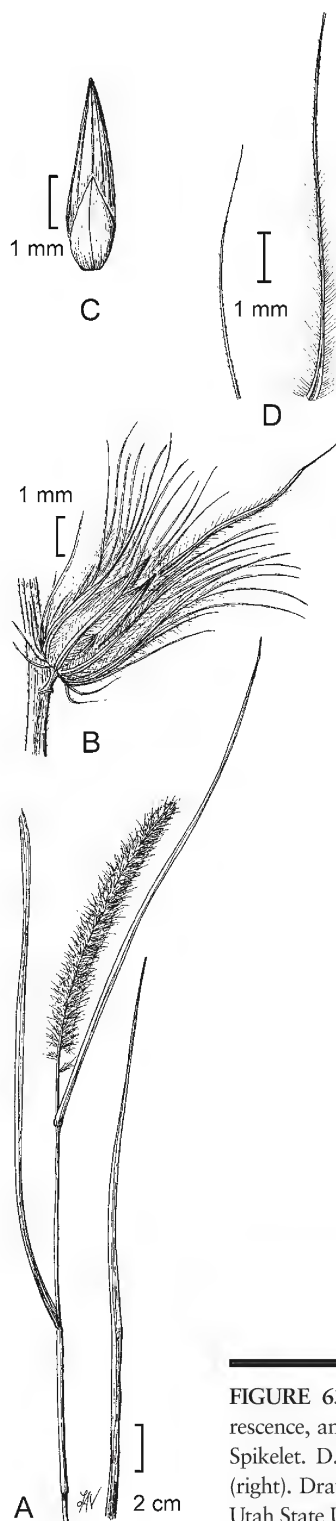


FIGURE 63. *Cenchrus ciliaris*. A. Culm, inflorescence, and leaf blade. B. Spikelet involucre. C. Spikelet. D. Outer bristle (left) and inner bristle (right). Drawn by Linda Ann Vorobik; copyright Utah State University.

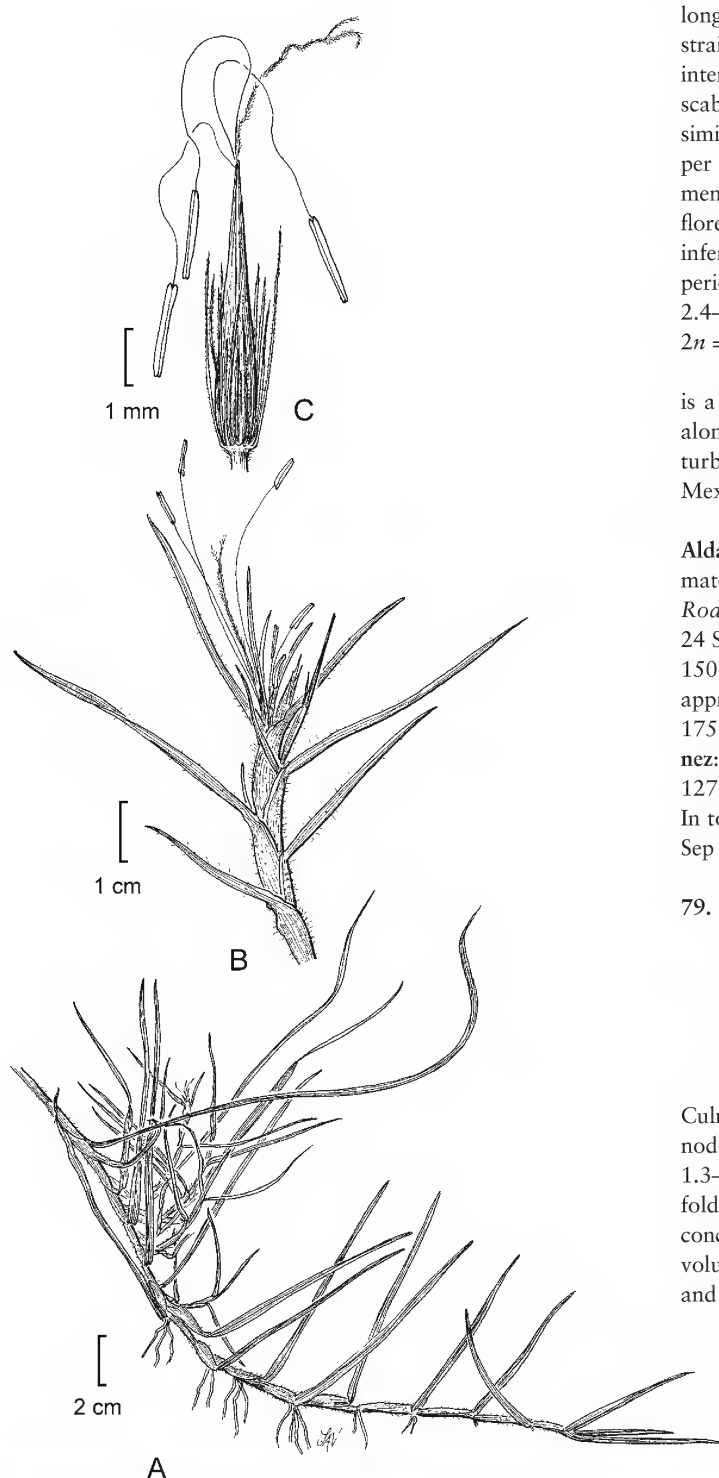


FIGURE 64. *Cenchrus clandestinus*. A. Habit. B. Portion of culm with spikelets near apex. C. Spikelet. Drawn by Linda Ann Vorobik; copyright Utah State University.

long, 3–4 mm wide, elongated, pubescent, pedicels small, pilose; straight spines or some curved, with long hairs, pubescent on the internal margins, united only basally or a little higher, antrorsely scabrous, the internal feathery; lower verticil of similar spines, similar to bristles, shorter than the internal spines. Spikelets 2–4 per involucre. Lower glumes 1–2.5 mm long, 1-veined, slender, membranous; upper glumes 1–3 mm long, 1- to 3-veined; inferior floret staminate; inferior lemma 2–4.5 mm long, 5- to 6-veined, inferior palea 2–4 mm long, partially covered by the lemma; superior florets bisexual, 2.2–5 mm long, 1–1.5 mm wide; anthers 2.4–2.6 mm long. Caryopsis 1.2–1.9 mm long, 0.4–1 mm wide.  $2n = 45$

**DISTRIBUTION AND HABITAT.** *Cenchrus ciliaris* is a weed native to Africa, western Asia, and India and grows along road margins and cultivated areas in desert scrub and disturbed tropical forests. It ranges from Canada, the United States, Mexico, Central and South America to the Caribbean Islands.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** km 60 carr. [hwy] Chihuahua–Ojinaga, 25 Aug 1978, matorral de gobernadora [governor's scrub], 1270 m, *Molinár-Rodríguez & Baray* 28 (CIIDIR). **Chihuahua:** La Campana, 24 Sep 76, Jardines de observación [observation gardens], 1500 m, *S. González* 765, 762, 777 (RELC). **Hidalgo del Parral:** approx. 20 mi N from Parral, 21 Jul 2006, grazed introduced, 1750 m, *K.R. Adams & N. Matínez* 054-2006 (CIIDIR). **Jiménez:** along hwy 49 ca. 167 km N of Gómez Palacio, 25 Sep 2004, 1279 m, *R.M. King & R.M. Garvey* 13470 (CIIDIR). **Meoqui:** In town of Meoqui, along hwy 45, SE of city of Chihuahua, 25 Sep 2004, 1140 m, *R.M. King & R.M. Garvey* 13465 (CIIDIR).

79. *Cenchrus clandestinus*\* (Hochst. ex Chiov.) Morrone, Ann. Bot. (Oxford), n.s. 106: 127. 2010. *Pennisetum clandestinum* Hochst. ex Chiov., Annuario Reale Ist. Bot. Roma 8(1): 41, pl. 5, f. 2. 1903.

FIGURE 64

Perennial; rhizomatous and stoloniferous, mat-forming. Culms 3–45 cm tall, prostrate, highly rooting from lower nodes; nodes glabrous. Sheaths glabrous or pubescent; ligules 1.3–2.2 mm long; blades 1–15 cm long, 1–6 mm wide, flat or folded, glabrous or pubescent. Panicles 2–2.7 cm long, axillary, concealed in the sheaths; rachises flat, glabrous or scabrous. Involucres 1–6; axes to 0.5 mm long, with 1–2 spikelets; outer and inner bristles alike, 6–15, 0.5–10.9 mm; primary bristles

10–14 mm long, usually not noticeably longer than the other bristles. Spikelets 10–22 mm long, sessile or pedicellate, pedicels to 0.2 mm; lower glumes usually absent, sometimes to 0.5 mm long, veinless; upper glumes 0–1.3(3.5) mm long, veinless; lower florets sterile; lower lemmas 10–22 mm long, 9- to 13-veined; lower paleas usually absent; upper lemmas 10–22 mm long, 8- to 12-veined; upper paleas 2- to 7-veined; anthers 4.7–7 mm long, long-exserted from the florets at anthesis.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus clandestinus* is native to Africa. It now grows in many parts of the world, often as a forage or lawn grass.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. In all the towns and municipalities of the state it is cultivated in gardens of houses and buildings, but there are few herbarium specimens.

80. *Cenchrus durus* (Beal) Morrone, Ann. Bot. (Oxford), n.s. 106: 128. *Pennisetum durum* Beal, Grass. N. Amer. 2: 163. 1896.

Perennial. Culms 100–200 cm tall, erect, robust, rigid, glabrous, glaucous, solitary or grouped, from a hard, knotty base, branched on superior nodes, slightly compressed. Sheaths glabrous or scabrous, pubescent on margins toward the apex, margin scarious, collar pubescent; ligules 1.5–2 mm long, densely ciliate; blades 20–60 cm long, 5–17 mm wide, ascending to divaricate, rigid, scaberulous or glabrous, largely apiculate, narrow on the base. Inflorescence a spike 3–10(12) cm long, 8–10 mm wide, terminal, rachis slender, narrow, scabrous, involucre sessile, ascending, bristles scarce, glabrous, unequal, shorter than spikelets, internal bristle longer, sometimes twice as long as spikelet. Spikelets 6–7 mm long, 1.5 mm wide, acuminate, glabrous, solitary, sessile; glumes unequal, obtuse to subacute, ciliate, lower glumes 2–2.3 mm long, 1- to 3-veined, upper glumes 3–3.5 mm long, 3- to 5-veined; lemma sterile 5.8–7 mm long, 5-veined, concave on the back, acute; palea reduced; lemma fertile 6–7 mm long, acuminate, scabriusculous especially on the apex; stigmas plumose, black. Caryopsis subhardened, acuminate.

**DISTRIBUTION AND HABITAT.** *Cenchrus durus* is an endemic Mexican species from Chihuahua and Oaxaca.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** entering Barranca El Cobre, 28.3 km S of Cusarare on road to Guachochi, 25 Sep 1988, 1900 m, P.M. Peterson & Annable 5904 (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, P.M. Peterson, Annable & Y. Herrera 8020 (US). **Ocampo:** Cascada de Basaseachic, 4 Oct 1982, bosque de pino-encino [pine-oak forest], 2000 m, Tenorio & Romero 1941 (CIIDIR); Parque Nacional “Cascada de Basaseachi”, in the barranca [canyon] at the base of the falls, 11 Nov 1989, 1700 m, Spellenberg, R. Corral, T. Lebgue & M. Mabrt 10074 (ARIZ, CIIDIR, NMC); Parque Nacional Cascada Basaseachic, por la vereda que va de la parte alta de la cascada [by path from high part of waterfall] a “La Ventana”, 22 Sep 1990, bosque de pino-encino, 1980 m, R. Corral RCD3887

(UACJ); Area of Cascada de Basaseachic at the confluence of Rio Basaseachic and Rio Durazno, Ca. 2 mi S of Village of Basaseachic, 17 Oct 1986, 1800 m, G.L. Nesom & L.A. Vorobik s.n. (ARIZ).

81. *Cenchrus echinatus*\* L., Sp. Pl. 2: 1050. 1753.

FIGURE 65

Annual. Culms 20–100 cm tall, ascending from a geniculate base. Sheaths from shorter than to equaling the internodes, compressed; ligules 0.7–1.7 mm long; blades 4–18(35) cm long, 2–10(14.2) mm wide, adaxial surfaces sparsely pilose, hairs papillose-based. Panicles 2.5–12 cm long; rachis internodes 2–4 mm long; involucre 5–10 mm long, 3.5–6(6.3) mm wide, imbricate; outer bristles 10–20, terete, the majority no more than ½ as long as the inner bristles; inner bristles 2–5 mm long, 0.6–1.5 mm wide, flattened, not grooved, mostly erect, fused for at least ½ their length into a globose cupule, sometimes interlocking at maturity, shortly pubescent, often purple at maturity. Spikelets 2–3(4) per involucre (fascicle), 4.8–7 mm; lower glumes 1.3–3.4 mm long; upper glumes 3.8–5.7 mm long, 3- to 7-veined; lower lemmas 4.5–6.5 mm long; upper florets 4.7–7 mm long; anthers 0.8–2.4 mm long. Caryopsis ovoid, 1.2–3.2 mm long, 1.3–2.2 mm wide.  $2n = (34), 68$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus echinatus* grows in disturbed areas throughout the coastal plain and piedmont of the southern United States, Mexico, Central and South America, and as an unwelcome introduction elsewhere. Widely distributed; however there are few specimens in herbaria.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** SW of Chihuahua, Aug–Nov 1885, E. Palmer 22 (US).

82. *Cenchrus michoacanus* H. F. Gut & Morrone, Bol. Soc. Argent. Bot. 47(1–2): 268. 2012.

*Pennisetum crinitum* (Kunth) Spreng.

Perennial; caespitose. Culms 150–250 cm tall, 6–10 mm thick, erect, branched, glabrous, internodes solid. Leaves glabrous; sheaths, some carinate, short; ligules 0.5–1.3 mm long, a pilose membrane, blades 20–40 cm long, 8–18 mm wide, flat, thick, slightly wider toward the base, never cordate. Inflorescence 12–18 cm long, 10–15 mm wide, solitary, terminal, spikelet, straw color or dark green, rachis striate, scabrous, straight or curved, involucre with 1 spikelet, sessile, bristles almost 30, mostly longer than spikelets, 5–8 mm long, scabrous, internal bristles 12–20 mm. Spikelets 5–6 mm long, acuminate, lower glumes 1.5–2.5 mm long, 1-veined, subacute to acute, upper glumes 0.5–0.7 mm shorter than the spikelet, 5-veined, acute or acuminate; inferior floret sterile, inferior lemma as long as the spikelet, 5-veined; inferior palea missing; superior lemmas 4.5–5.4 mm long, chartaceous toward the base, apically membranaceous, glabrous; anthers 1.9–2 mm long, glabrous. Caryopsis 0.5–1.5 mm long, elliptic.

**DISTRIBUTION AND HABITAT.** *Cenchrus michoacanus* grows in abandoned fields and grasslands with thorny



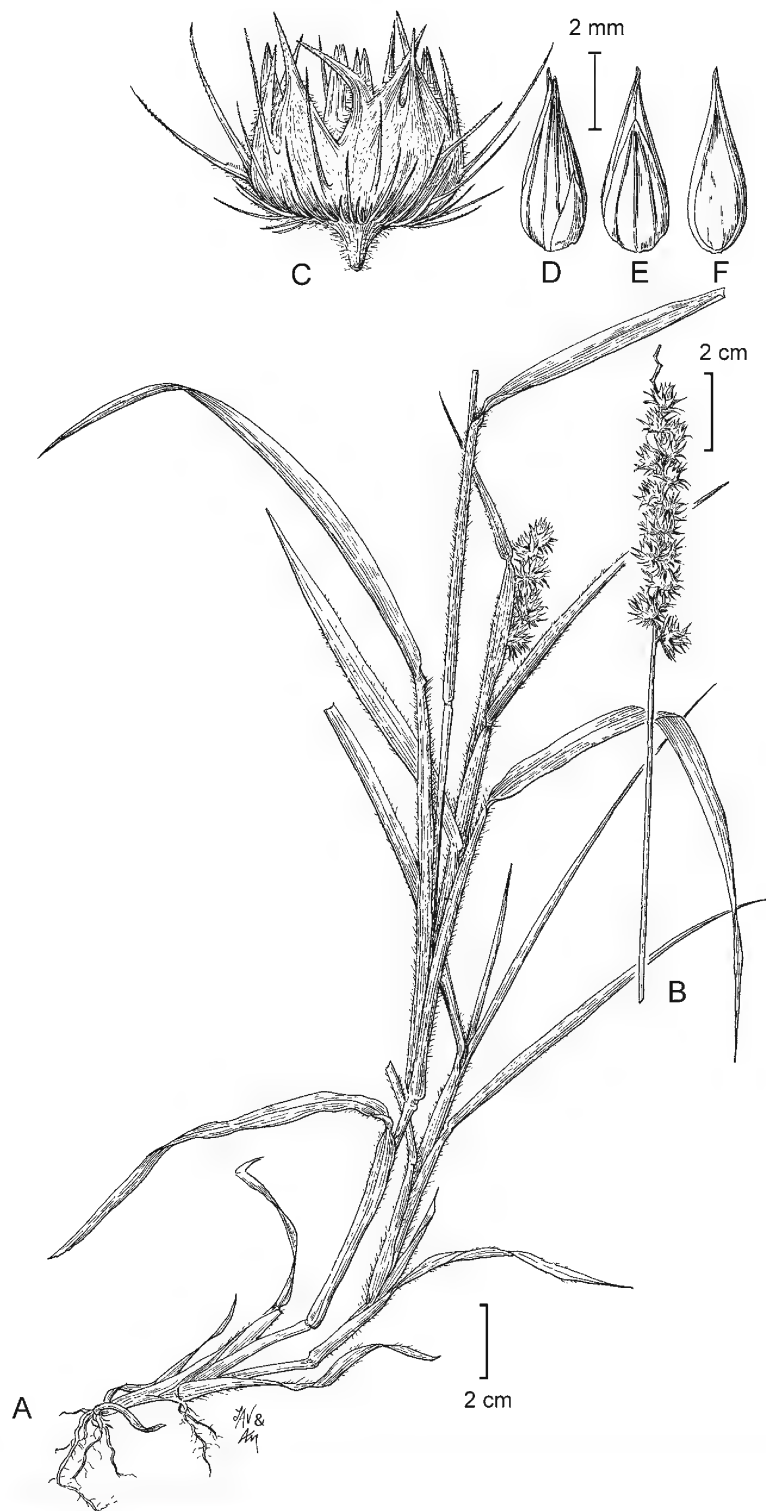


FIGURE 65. *Cenchrus echinatus*. A. Habit. B. Inflorescence. C. Involucre (fascicle). D. Lower glume. E. Upper glume. F. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

scrubs. It is a Mexican species from Chiapas, Guanajuato, México, and Michoacán.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Delicias:** approx. 3 mi S of Delicias on Mex 45, 30 Mar 1971, 4200 ft, W.E. Harmon S-375 (ENCB). **Julimes:** Potrero Mts, 12 Oct 1886, C.G. Pringle 817 (US), Isotype.

83. *Cenchrus multiflorus* J. Presl, Reliq. Haenk. 1(4–5): 318. 1830.

Perennial; caespitose, base with scaly buds. Culms 50–160 cm tall, erect, simple or scarcely branched, glabrous or pilose. Sheaths sparsely carinate, glabrous to papillose-pilose; ligule 1.3–1.8 mm; blades 20–45 cm long, 5–10(20) mm wide, scabrous to sometimes spread papillose-pilose adaxially. Inflorescence 5–10(18) cm long, 10–15 mm wide, involucre 7–12 mm long, 2.5–3.5 mm wide, external bristles free, cylindrical, antrorse scabrous, the internal ones only united at the base, cylindrical, spread to moderate pilose. Spikelets 5–6(9) mm long, 2–5 per involucre (fascicle); lower glumes 2.2–2.9 mm long, 1-veined; upper glumes 3–5.2 mm long, 3- to 5-veined; inferior florets staminate, lemma of the inferior floret as long as the spikelet, 5- to 7-veined, paleas equal to lemmas or a little shorter; upper florets 5.2–6.6 mm long, 1–1.5 mm wide; anthers 1.9–3 mm long.  $2n = 34$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus multiflorus* grows in deciduous tropical forests at 1,250–1,750 m; it is a Mexican species from Chiapas, Chihuahua, Durango, Guerrero, Jalisco, Oaxaca, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Vicinity of Areponapuchic, slopes of Barranca de Urique, Aug 1954, I. Knobloch 1363 (US). **Bocoyna:** entre [between] Barranca del Cobre & Bacahipare, 17 Aug 1976, 1160–1640 m, S. González 738 (ENCB, RELC). **Chihuahua:** La Campana, 24 Sep 76, Jardín de observación [observation garden], 1500 m, S. González 779 (RELC). **Uruachi:** Guazaremos, Río Mayo, 5 Aug 1935, Gentry 1568 (US).

84. *Cenchrus myosuroides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 115–116, t. 35. 1815.

FIGURE 66

Perennial. Culms 5–200 cm long, stout, glaucous. Sheaths from shorter than to equaling the internodes; ligules 1.5–2(3.4) mm long; blades 12–40 cm long, 4–13 mm wide, glabrous or sparsely pilose adaxially. Panicles 4–23 cm; involucre 3.8–8 mm long, 1.2–2.6 mm wide, composed of several whorls of bristles, not bur-like; bristles 3–5.8 mm long, 0.2–0.6 mm wide, fused only at the base, not forming a cupule, terete, increasing in size inward, inner bristles pubescent on the lower  $\frac{1}{2}$ – $\frac{2}{3}$ . Spikelets 3.8–4.8(5.6) mm long, 1(2–3) per involucre (fascicle); lower glumes 1.5–3 mm long; upper glumes 3–5 mm long, 3- to 5-veined; lower lemmas 3–5.5 mm long; upper lemmas 3.8–5.4 mm long; anthers 0.8–2.2 mm long. Caryopsis 1.5–2.6 mm long, 1–1.5 mm wide, ovoid.  $2n = (54), 70$ .

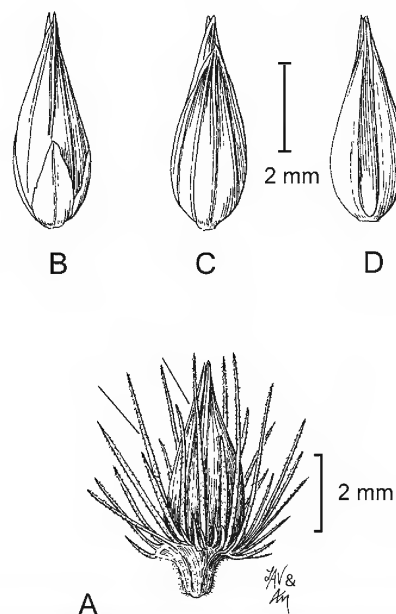


FIGURE 66. *Cenchrus myosuroides*. A. Involucre (fascicle). B. Lower glume and lower lemma. C. Upper glume. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Cenchrus myosuroides* grows mostly along roadsides and in other waste places. Its native range extends through the Caribbean and Central America to northern South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, L. H. Harvey 1388 (US); 10 mi N of Ciudad Camargo, 4 Oct 1953, 1280 m, Reeder & C. Reeder 2613 (ENCB). **Chihuahua:** Chihuahua, 8 Sep 1885, E. Wilkinson s.n. (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1463 m, Soderstrom 897 (US); near Chihuahua, 25 May 1885, C.G. Pringle 429 (US); Rancho experimental La Campana, 82 km al N de la cd. de Chihuahua, 26 Aug 1978, jardines de observación [observation gardens], 1550 m, C.A. Fernández s.n. (ENCB). **General Trías:** km 40 carr. [hwy] Chihuahua–Cuahutémoc, 12 Aug 1976, matorral [scrub], 1500 m, S. González & J.M. Peña 538 (RELC). **Guachochi:** 8.9 km NE of La Bufa on road to Creel, 12 Sep 1989, 1780 m, P.M. Peterson, Annable & Y. Herrera 8068 (ENCB, US). **Jiménez:** 60 km N of Escalon, 27 Jul 1939, 1280 m, L. H. Harvey 1302 (ENCB). **Mecoqui:** Mecoqui, 8 Aug 1936, LeSueur 0140 (US); **Saucillo:** along Isla de Perla road about 4 mi E of Cd. Delicias, 11 Jul 1950, 1250 m, Reeder, C. Reeder & Goodding 1265 (ENCB).

85. *Cenchrus polystachios*\* (L.) Morrone, Ann. Bot. (Oxford), n.s. 106: 129. 2010. *Pennisetum polystachion* (L.) Schult., Mant. 2: 146. 1824.

FIGURE 67

Annual or perennial; caespitose from a hard, knotty base. Culms 30–200 cm tall, erect, branching; nodes glabrous. Sheaths glabrous, margins ciliate; ligules 1.5–2.7 mm long; blades 15–55 cm long, 4–18 mm wide, flat, glabrous or pubescent. Panicles 10–25 cm long, 15–30 mm wide, terminal, fully exerted from the sheaths, erect to drooping, white, yellow, light brown, or pink to deep purple; rachises terete, scabrous. Involucres 33–45 per cm long, disarticulating at maturity; involucres axes 0.2–0.5 mm long, with 1 spikelet; outer bristles 13–30, 1.3–5 mm long, scabrous; inner bristles 6–14, 4.3–11.5 mm long, long-ciliate; primary bristles 14–25 mm long, long-ciliate, noticeably longer than the other bristles. Spikelets 3–4.5 mm long, sessile; lower glumes absent or to 2 mm long, veinless; upper glumes 3–4.5 mm long, glabrous, 5- to 7-veined, 3-lobed; lower florets sterile or staminate; lower lemmas 3–3.9 mm long, 5- to 7-veined, apex lobed; lower paleas 2.9–3.7 mm; anthers absent or 1.7–2 mm long; upper florets disarticulating at maturity; upper lemmas 1.7–3 mm long, coriaceous, shiny, 5-veined, apex ciliate; anthers 1.3–2.1 mm long. Caryopsis about 1.7 mm long, concealed by the lemma and palea at maturity.  $2n = 18, 36, 45, 48, 52, 53, 54, 56, 78$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus polystachios* is a polymorphic, weedy African species that has become established in the tropics and subtropics; it is considered a noxious weed in North America. Wipff (2003) followed Brunken (1979a; 1979b) in recognizing two subspecies in the *Flora of North America*, and we concur. Ours is perennial, usually sparingly branched, and has involucres yellow, light brown, or purplish. We make a new combination for this taxon below.

*Cenchrus polystachios* subsp. *setosum* (Sw.) P. M. Peterson & Y. Herrera, **comb. nov.** Basionym: *Cenchrus setosus* Sw., Prodr. 26. 1788  $\equiv$  *Pennisetum polystachion* subsp. *setosus* (Sw.) Brunken, Bot. J. Linn. Soc. 79: 63. 1979. Holotype: WEST INDIES (JAMAICA). O.P. Swartz s.n. (S 506-637 [image!]).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Delicias: approx. 3 mi S of Delicias on Mex 45, 30 Mar 1971, along railroad adjacent to and creosote flats, 4200 ft, W.E. Harmon & Dunn 5375 (ENCB); P. Gallian & B.J. Cox 394 (ENCB); B.J. Cox 2879 (ENCB).

86. *Cenchrus spinifex* Cav., Icon. 5 : 38, t. 461. 1799.

*Cenchrus incertus* M. A. Curtis.

FIGURE 68

Annual or biannual; caespitose. Culms 10–80 cm tall, ascending or erect, branched, forming big mats, scabrous.

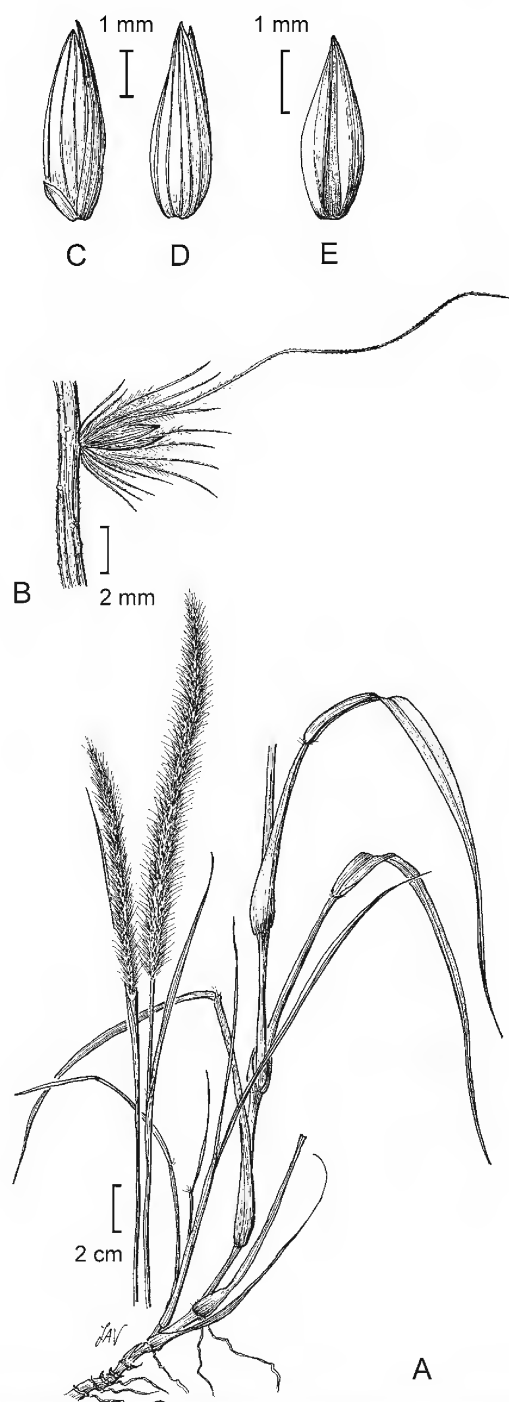


FIGURE 67. *Cenchrus polystachios*. A. Habit. B. Spikelet involucre. C. Spikelet showing lower glume on left. D. Spikelet showing upper glume. E. Upper lemma. Drawn by Linda Ann Vorobik; copyright Utah State University.

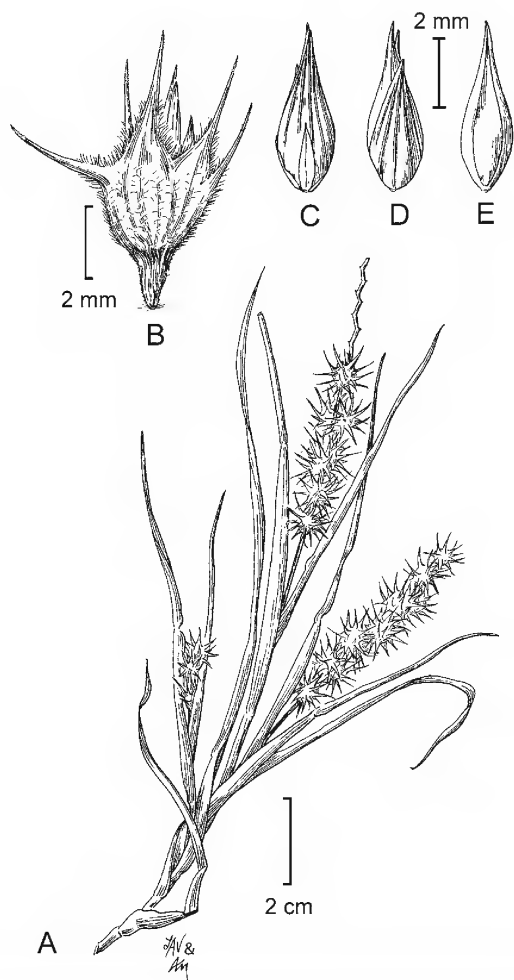


FIGURE 68. *Cenchrus spinifex*. A. Habit. B. Involucre (fascicle). C. Lower glume. D. Upper glume. E. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

Sheaths carinate, glabrous to pubescent along the margins; ligule 1–1.5 mm long, pilose; blades 3–10 cm long, 2–6 mm wide, flat to sometimes subinvolute. Inflorescence 2–8.5 mm long, 0.8–2 cm wide, with variable numbers of fascicles, the axis slender flexuous, scabrous or pilose; involucre 5–10 mm long, 2.5–5.5 mm wide, ovoid or globose, densely pubescent, with 8–40 united thorns fused to ½ their length, extended or reflexed, wide at the base, the exterior cylindrical, the interior flattened, involucre body deeply notched on the external face. Spikelets 3.5–5.8 mm long, 2–4 per involucre (fascicle); lower glumes 1.5–3 mm long, 1-veined, upper glumes 2.8–5 mm long, 5- to 7-veined; inferior florets staminate, inferior lemma

3–5.8 mm long, 4- to 7-veined, inferior palea 3–5.8 mm long; superior florets bisexual, 3.4–6 mm long; anthers 0.5–2 mm long.  $2n = 34$ .

**DISTRIBUTION AND HABITAT.** *Cenchrus spinifex* is a weed that grows in disturbed sites and wet areas in the subtropical and xerophilous scrub and grasslands at elevations of 1,250–2,200 m. It ranges from United States, Mexico, Caribbean, and Central America to South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Balleza: 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, scrub lands, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10728 (CIIDIR, US). Camargo: 20 km S of Cd. Camargo, 2 Aug 1939, L. H. Harvey 1393 (US). Casas Grandes: near Casas Grandes, 30 Aug 1899, E.W. Nelson 6327 (US). Chihuahua: near Chihuahua, 3 Sep 1935, LeSueur Mex-07 (US); Hitchcock 7788 (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, Soderstrom 908 (US); 6 mi N of Chihuahua, 8 Oct 1959, 1494 m, Soderstrom 925 (US); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, J.K. Meents & W.H. Moir 90 (NMC); Presa Chihuahua, 7 Aug 1975, vegetación riparia [riparian vegetation], 1550 m, J.M. Peña JMP-75 (RELC). Delicias: 7 mi S of Delicias along Hwy 45, 24 Sep 1972, 1350 m, J. Henrickson 8002 (NMC). Gran Morelos: 10 mi W of General Trias off hwy 16, 19 Aug 1975, 5850 ft, Ellis, Dunn, & Wallace 936 (ENCB). Hidalgo del Parral: 2 mi E of Parral on road to Cd. Juarez, 3 Oct 1959, Soderstrom 861 (US). Janos: Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1937, 1450 m, L. H. Harvey 1605 (US). Juárez: aprox. 7 km al N del poblado [village] de Samalayuca, a los lados de la carr. [to sides of hwy], 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5316 (UACJ); km 32 Juárez–Chih., 13 Oct 1997, matorral de gobernadora [governor's scrub], I. Enríquez, S. Ordoñez & J. Leyva IEA4 (UACJ). Meoqui: Lazaro Cardenas, 5 Aug 1974, C. Rodríguez, O. Agundis, S. Acosta 1191 (US). Riva Palacio: Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7956 (US); San Francisco de Conchos: carr. de Aldama a la presa sobre [to dam on] el Río Conchos, 25 Aug 1966, 1300 m, M.F. Robert s.n. (ENCB). Saucillo: along Isla de Perla, about 4 mi E of Ciudad Delicias, 11 Jul 1950, 1250 m, Reeder, C. Reeder & Goodding 1257, 1263 (ENCB).

### ***Chaetium* Nees**

Perennial; with flatted leaves and panicles narrow and dense. Spikelets with a fertile floret and another rudimentary, represented by a sterile lemma, pedicelled, dorsally compressed, the bearded base of the lower glumes attached to rachilla, forming a long callus, slender, at the point of disarticulation above the very oblique base of pedicel. Glumes narrow or wide, subequal, prolonged into long awns; lemma of the sterile floret shortly

awned or only mucronate; lemma of the fertile floret somewhat hardened, acuminate, mucronate or awned, the margins slender, flattened, not enclosing the paleas at the base.

*Chaetium* is a genus with three species, one distributed in Cuba, one from South America, and ours found in Mexico and Central America.

87. *Chaetium bromoides* (J. Presl) Benth. ex Hemsl., Biol. Cent.-Amer., Bot. 3: 503. 1885. *Berchtoldia bromoides* J. Presl, Reliq. Haenk. 1: 324, t. 43. 1830.

Perennial; with strong stolons at the base. Culms 35–100 cm tall, erect or ascending, simple or branched; internodes compressed, glabrous, nodes bearded. Sheaths keeled, glabrous, but densely silky-pubescent on margins; ligule 1–2 mm long, a row of cilia; blades 10–30 cm long, 3–7 mm wide, papillose-pilose, flat to folded, narrowed toward the apex. Panicle 10–23 cm long, 1–2 cm wide, erect, the axis and rachis scabrous, racemes erect, appressed. Spikelets 6–8 mm long excluding the awns, fusiform, greenish or purplish, with pedicels 2–3 mm long, antrorsely hispid with hairs 2–3.5 mm long; glumes 6–8 mm long, wide, 5- to 7-veined, scabrous, with purple spots, the awns 10–35 mm long, straight or slightly flexuous; lemma of the inferior florets 6–8 mm long, 3-veined; lemma of the superior floret 6–8 mm long, smooth, the awns 1.5–2 mm long; callus 1.5–2.5 mm long; anthers 1.2–1.5 mm long.  $2n = 26$ .

DISTRIBUTION AND HABITAT. *Chaetium bromoides* grows in pine-oak forests in open or disturbed areas; it ranges from Mexico to Central America.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Chihuahua: Chihuahua, 1886, E. Palmer s.n. (US).

## *Chloris* Sw.

Annual or perennial; rhizomatous, stoloniferous, or caespitose. Culms internodes pith-filled. Sheaths strongly keeled, glabrous, scabrous, or pubescent; ligules membranous, erose to lacerate, ciliate or absent; blades often with long, coarse hairs near the base of the adaxial surface and margins. Inflorescence terminal, panicles with (1)5–30 spike-like branches, these usually borne digitately, in 2 to several whorls, often with a few isolated branches below the primary whorl(s), all branches usually exceeding the upper leaves; branches with spikelets in 2 rows on 1 side of the branch axes. Spikelets solitary, sessile to pedicellate, laterally compressed, with 2–3(5) florets, usually only the lowest floret bisexual, rarely the lower 2 florets bisexual, remaining floret(s) sterile or staminate; florets laterally compressed or terete, cylindrical to obovoid, awned or unawned, sterile and staminate florets progressively reduced distally; disarticulation usually beneath the lowest floret in the spikelets, all florets falling as a unit. Glumes unequal, exceeded by the florets, lanceolate, acute to acuminate, unawned, occasionally awned, awns to 0.3 mm; calluses bearded; lemmas of bisexual florets 3-veined, marginal veins pubescent, midveins usually glabrous, sometimes scabrous, usually excurrent into awn, sometimes merely mucronate, lemma apex truncate or obtuse, entire or bilobed, lobes when present can be awn-tipped; paleas shorter than lemmas, 2-veined, veins scabrous; anthers 3; lodicules 2. Caryopsis ovoid, elliptic, or obovoid.  $x = (9)10$ .

As interpreted here, *Chloris* is a tropical to subtropical genus of about 55 species and is most abundant in the Southern Hemisphere (Peterson et al., 2015). Two species treated here are native and one is introduced.

## KEY TO SPECIES OF *CHLORIS*

1. Fertile and rudimentary lemmas awnless or with a short mucro, less than 2 mm long, apiculate . . . . . *C. submutica*
1. Fertile and rudimentary lemmas prominently awned, the awn more than 3 mm long.
  2. Fertile lemma conspicuously grooved on the sides along the midvein and margins, with hairs about 1.5–2.4 mm long; annual; staminate or reduced florets 1 . . . . . *C. virgata*
  2. Fertile lemma not grooved on the sides, the hairs less than 1 mm long; perennial; staminate or reduced florets usually 2 or more . . . . . *C. gayana*

88. *Chloris gayana*\* Kunth, Révis. Gramin. 2: 293, t. 58. 1830.

FIGURE 69

Perennial; usually stoloniferous. Culms to 300 cm tall, erect. Sheaths glabrous or scabrous, often ciliate apically; ligules ciliate; blades to 30 cm long, 15 mm wide, scabrous. Panicles digitate, with 9–30 evidently distinct branches; branches 8–20 cm long, usually somewhat divaricate, spikelet-bearing to the base, averaging 10 spikelets per centimeter. Spikelets strongly imbricate, tawny, with 1 bisexual and (1)2–4 usually staminate, sometimes sterile, florets; lower glumes 1.4–2.8 mm long; upper glumes 2.2–3.5 mm long; lowest lemmas 2.5–4.2 mm long, 0.7–1 mm wide, ovate to obovate or elliptic, somewhat

gibbous, sides not grooved, pubescence variable, sides usually glabrous, sometimes scabrous or appressed-pubescent, margins usually glabrous or appressed-pubescent on the lower portions, sometimes throughout, sometimes with strongly divergent hairs distally, the hairs less than 1 mm long, often divergent, apex inconspicuously bilobed, awned, awns 1.5–6.5 mm long; second florets 2.2–3.2 mm long, 0.3–1 mm wide, staminate or sterile, similar to the first floret but more cylindrical, not widened distally, inflated, if at all, only near the apex, inconspicuously bilobed, awned, the awns 0.8–3.2 mm long; distal florets progressively smaller, longer than the subtending rachilla segment, awn-tipped or unawned. Caryopsis 1–1.5 mm long, about 0.5 mm wide.  $2n = 20, 30, 40$ .



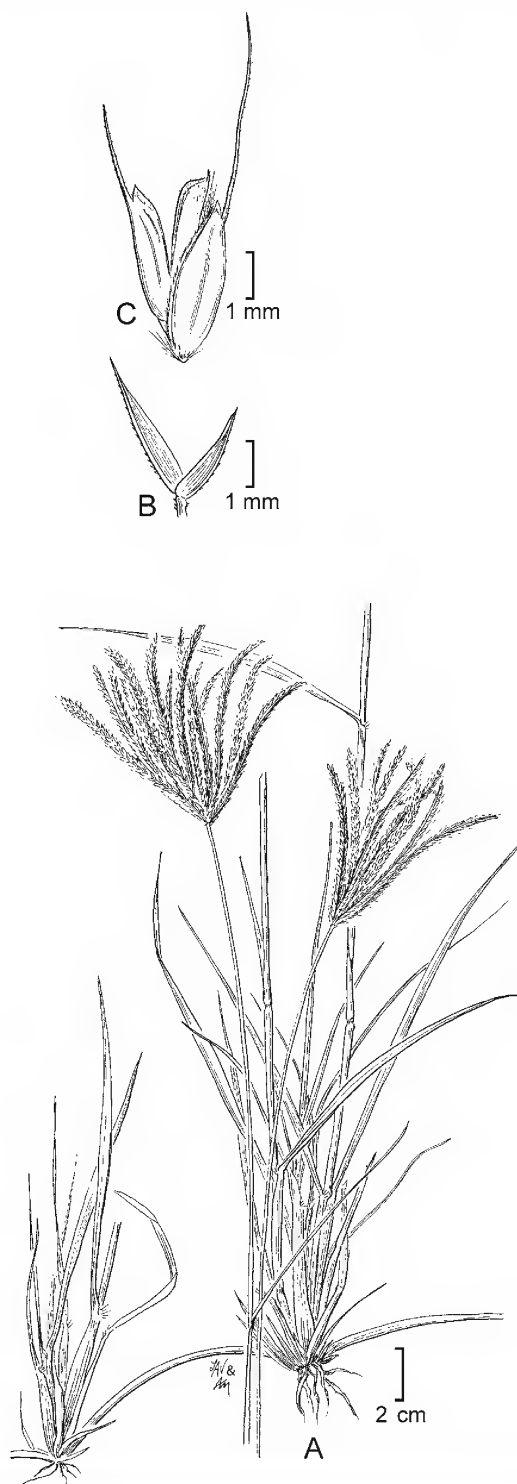


FIGURE 69. *Chloris gayana*. A. Habit. B. Glumes. C. Florets. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Chloris gayana* grows in warm-temperate to tropical regions throughout the world, including Mexico. It is cultivated as a meadow grass in irrigated regions of the southwestern United States.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: La Campana, Potrero El Plan; 3 km Ote. [W] carr. [hwy] Panamericana, 13 Sep 1973, Jardín de Observación [observation garden], 1500 m, Valdés-Reyna VR-237 (MEXU, RELC).

89. *Chloris submutica* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 167, t. 50. 1815.

FIGURE 70

Perennial; usually caespitose, occasionally shortly stoloniferous. Culms 30–75 cm tall, erect. Sheaths glabrous; ligules about 0.5 mm long, short ciliate; blades to 20 cm long, to 5 mm wide, sometimes with long basal hairs, otherwise scabrous. Panicles with 5–17 distinct branches in 1–3 closely spaced whorls; branches to 7 cm long, usually erect when young, spreading to reflexed at maturity, averaging 12 spikelets per centimeter. Spikelets with 1 bisexual and 1 staminate floret; lower glumes 1.5–3.2 mm long; upper glumes 2.5–3.4 mm long; lowest lemmas 2.8–3.7 mm long, 0.6–1.1 mm wide, broadly linear to elliptic, mostly glabrous but the margins appressed-pubescent, apex obtuse, not conspicuously bilobed, sometimes mucronate; second florets 1.4–2.2 mm long, 0.3–0.9 mm wide, usually at least twice as long as wide, not lobed, unawned, occasionally mucronate. Caryopsis 1.7–2.3 mm long, 0.5–0.6 mm wide, ellipsoid.  $2n =$  ca. 65, 80.

**DISTRIBUTION AND HABITAT.** *Chloris submutica* occurs in the southwestern United States, Mexico, Guatemala, and Colombia to Venezuela. In Mexico it is generally found between 1,000 and 2,100 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Balleza: La Ranchería, 14 km al E de Cabóachi, 14 Aug 1982, bosque de pino-encino [pine-oak forest], 2100 m, R. Hernández et al. 8925 (MEXU). Batopilas: Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, P.M. Peterson & J.M. Saarela 22057 (US). Casas Grandes: Rancho Palanganas (La Leona), 11 Sep 1995, pastizal [pastureland], 2200 m, Ing. González 114 (MEXU). Chihuahua: Valley near Chihuahua, 20 Aug 1885, C.G. Pringle 424 (US); La Campana, 4 km E carr. [hwy] Panamericana, 6 Sep 1973, 1500 m, Valdés-Reyna VR-115 (ENCB, RELC); Valley near Chihuahua, 6 Oct 1886, C.G. Pringle 993 (MEXU); Rancho Tepehuanes, acceso [access] de Chihuahua hacia [toward] Namiquipa, desviar [diver] en Campo 73 a la derecha tercac [to right dirt road] 6 km, 11 Oct 2000, pastizal, G. Gómez 312 (MEXU). Cuauhtémoc: 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9590 (US); along hwy 16 W of Chihuahua, 43.6 mi W of General Trias, edge of oak scrub and some pine just outside Casa-Colorada, 3 Aug 1977, 7900 ft, Dunn, Bennett, Torke & Wieder 22591 (ENCB); 11 mi W of Cuauhtémoc, 4 Sep 1967, 7000 ft, Reeder & C. Reeder 4845 (ARIZ,

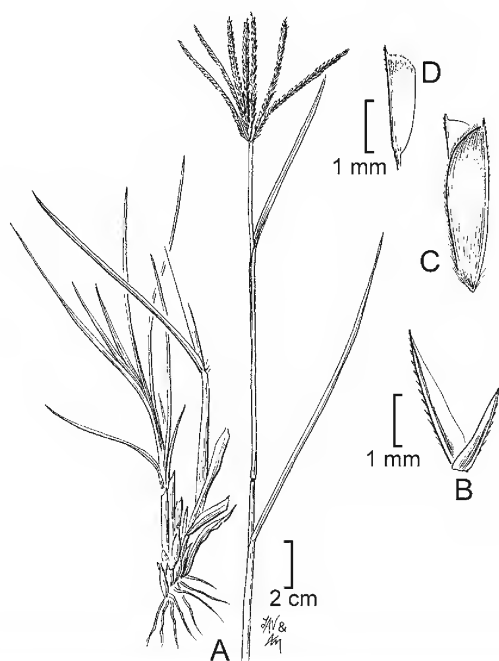


FIGURE 70. *Chloris submutica*. A. Habit. B. Glumes. C. Florets. D. Upper floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

ENCB, US); 9–7 km al N de entronques carrs. 26 & 18, 10 Aug 1975, comunidad riparia [riparian community], 2100 m, J.M. Peña JMP-141 (RELC). **Cusihuiriachi:** Río Papigochic, 40 km al Pte. de Chihuahua, carr. Cuahutémoc–Ocampo, 8 Aug 75, pastizal, 2100 m, J.M. Peña JNP-85 (RELC); Carichic, Laguna Mexicanos, 29 Aug 1977, pastizal, 2030 m, Blanco & Gómez 01/77 (MEXU). **Gómez Farías:** 3 km al W del pueblo [town] de Gómez Farías, 8 Oct 1995, orilla [shore] de carr., 2100 m, R. Corral, P. Olivas & J.O. Torres RCD6530 (UACJ). **Guachochi:** Carr. Guachochi–Creel km 20, 24 Sep 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], R. Fierros 1612 (MEXU); Cusarare, 17 Sep 1973, bosque de pino, 6900 ft, Bye 5164 (MEXU). **Gran Morelos:** km 32.5 (a partir del entronque de la carr. [from junction of hwy] Panamericana) carr. Chihuahua–Namiquipa, 24 Sep 1997, bosque de encino, 2340 m, M.A. Vergara 185 (MEXU). **Guerrero:** 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, P.M. Peterson & Annable 5841 (ENCB, US); railroad NW of San Isidro, Sierra Madre Occidental, 18 Sep 1934, 1990–2010 m, Pennell 18986 (MEXU, US); Carr. La Junta–San Juanito, 17 km, 22 Sep 1997, 2290 m, B. Tah V. 3 (MEXU); Temochi, 2 km alrededor del poblado [around the village], 24 Sep 1997, bosque de pino, 2100 m, M.A. Vergara 141 (MEXU). **Ignacio Zaragoza:**

20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, P.M. Peterson & R.M. King 8166 (US). **Madera:** Paraje Agua Caliente, predio particular [private property] El Chorruto, 17 Oct 1990, bosque de encino, 2350 m, O. Bravo 1947 (CIIDIR); 10 km al N de Madera, 5 Oct 74, bosque de pino-encino, 2100 m, Valdés-Reyna VR-687 (RELC). **Moris:** Mesa del Agua, 4.8 km S of Campanero (on Mesa de Campanero), 29 Sep 2003, 1990 m, T.R. Van Devender, A.L. Reina, M.A. Dimmitt & M.W. Eubanks 2003-1101 (NMC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8672 (NMC); Parque Nacional “Cascada de Basaseachic,” ca. 130 air km W of Cuauhtemoc, 12 Sep 1987, 1980 m, Spellenberg & D. Jewell 9289 (MEXU, NMC). **Riva Palacio:** Majalca (Pilares), 12 Aug 1939, L. H. Harvey 1483 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7967 (US). **Temosachi:** Nabogame, 29 Jul 1987, 1800 m, Laferr. 585 (MEXU).

90. *Chloris virgata* Sw., Fl. Ind. Occid. 1: 203. 1797.

*Chloris elegans* Kunth.

FIGURE 71

Annual; usually tufted, occasionally stoloniferous. Culms 10–100+ cm tall. Sheaths usually glabrous; ligules to 4 mm long, erose or ciliate; blades to 30 cm long and 15 mm wide, basal hairs to 4 mm long, otherwise usually glabrous, occasionally pilose. Panicles digitate, with 4–20 distinct branches; branches 5–10 cm long, erect to ascending, averaging 10 spikelets per centimeter. Spikelets strongly imbricate, with 1 bisexual and 1(2) sterile floret(s); lower glumes 1.5–2.5 mm long; upper glumes 2.5–4.3 mm long; lowest lemmas 2.5–4.2 mm long, keels usually prominently gibbous, glabrous, or conspicuously pilose, sides not grooved, margins glabrous, scabrous or pilose basally with conspicuously longer hairs distally, the hairs 1.5–2.4 mm long, lemma apex not conspicuously bilobed, awned, the awns 2.5–15 mm long; second florets 1.4–2.9 mm long, 0.4–0.8 mm wide, somewhat widened distally, not inflated, bilobed, lobes less than  $\frac{1}{2}$  as long as the lemmas, awned from the sinuses, the awns 3–9.5 mm long; third florets greatly reduced, unawned and shorter than the subtending rachilla segment or absent but the rachilla segment present. Caryopsis 1.5–2 mm long, about 0.5 mm wide, elliptic.  $2n = 20, 26, 30, 40$ .

**DISTRIBUTION AND HABITAT.** *Chloris virgata* is a widespread species that grows in many habitats, from tropical to temperate areas with hot summers, including much of the United States, and is a common weed in alfalfa fields of the southwestern United States.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 32 km SW de Villa Ahumada, cerca [near] del rancho Santo Domingo rumbo [course] a Casas Grandes, 22 Oct 54, Hern.-Xol. & C. Tapia N-93 (US); km 1891 carr. [hwy] Juárez, sur [S] de Gallegos, 1 Dec 1954, Hern.-Xol. & C. Tapia

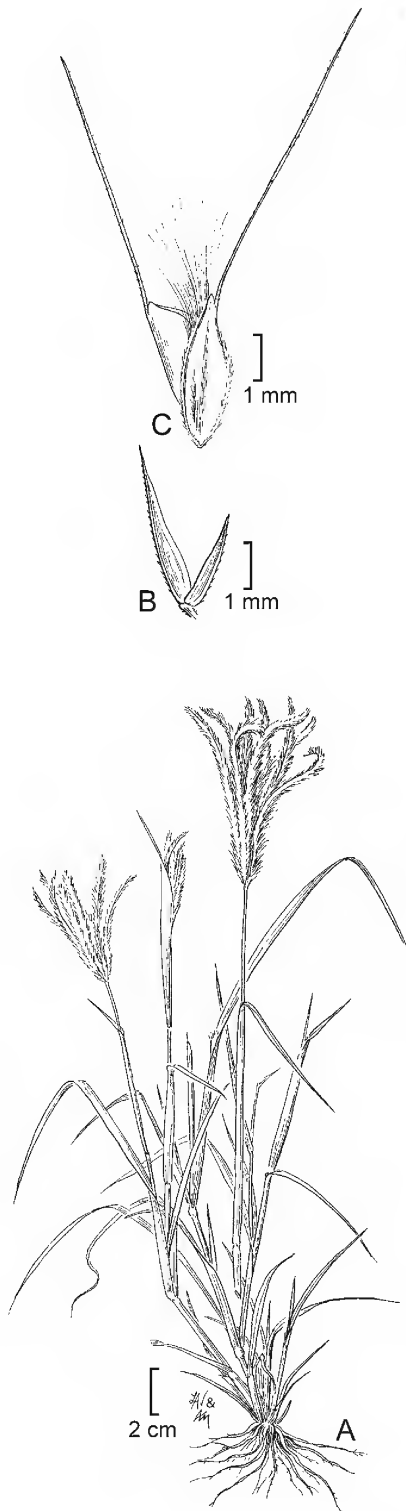


FIGURE 71. *Chloris virgata*. A. Habit. B. Glumes. C. Florets. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

N-1154 (US); Cañón de Santa Clara, 90 km al N de Chihuahua, 19 Oct 1974, 1700 m, *Rzedowski* 32369 (ENCB); 44 km al N del poblado [village] Villa Ahumada por la carr. Panamericana (Méx 45), 7 Oct 1995, 1200 m, *R. Corral, P. Olivas & J.O. Torres* RCD6443 (UACJ); 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5369 (UACJ). **Aldama:** San Diego de Alcalá por la carr. Chihuahua-Delicias, matorral-pastizal [scrub-pastureland], 20 Aug 1996, 1200 m, *E. Estrada & C. Yen* 5713(NMC); Baños de San Diego, 1.8 km E of San Diego de Alcalá, ca. 16 km of jet of local road with Hwy 45, 14 Oct 1986, area of hot springs, 1200 m, *G. Neson & L. Voborob* 5515 (MEXU); 30.5 mi NE of Aldama along Hwy 16, 15 Sep 1972, pastizal, 4300 ft, *J. Henrickson* 7600 (MEXU); 60 km Chih-Ojinaga, 25 Aug 1978, matorral, 1270 m, *Molinar, Rodríguez, Baray* 45 (MEXU). **Allende:** 20 mi N from Parral to Jiménez on hwy 45, 21 Jul 2006, grassland, 1750 m, *K.R. Adams & N. Martínez* 057-2006 (CIIDIR). **Ascensión:** Cerro de Borregas, about 8 km E of Guzmán, 22 Aug 1972, matorral, 1250 m, *F. Chiang, T. Wendt & M.C. Johnston* 8790 (MEXU). **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20020, *F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 118 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino-encino [pine-oak forest], 1891 m, *P.M. Peterson & P. Catalán* 17537 (US). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7688 (US); **Buenaventura:** 19 km El Carmen-El Sueco, 25 Oct 1954, pastizal, *Hern.-Xol. & C. Tapia* N-252 (US). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, *L. H. Harvey* 1392 (US); Rancho Mesteñas, 20 km S de La Perla, 20 Oct 1996, 1450 m, *C. Yen & E. Estrada* 6728 (NMC). **Casas Grandes:** between Casas Grandes and Sabinal, 4-5 Sep 1899, *E.W. Nelson* 6354 (US); Valle de las Cuevas al S del Ejido Ignacio Zaragoza, 25 Sep 1982, 1760 m, *Tenorio & Romero* 1710 (ENCB, MEXU); Rancho Tapiacitas, Casas Grandes a Col. Juárez, 18 Abr [Apr] 2000, pastizal, *G. Gómez* 21 (MEXU). **Chihuahua:** near Chihuahua, 20 Sep 1885, *C.G. Pringle* 474 (US); Mts near Chihuahua, 10 Oct 1935, *LeSueur* Mex-063, *Mex-067* (US); 6 mi N of Chihuahua, 8 Oct 1959, *Soderstrom* 920 (US); Cd. Guerrero-Sto. Tomas, 29 Oct 1954, *Hernández-X & C. Tapia* N-364 (US); 5 mi SW of Chihuahua, 14 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3461 (ARIZ, ENCB, US); Rancho La Presa, 21 Oct 1954, 1100 m, *Hern.-Xol. & C. Tapia* N-70 (ENCB, US); La Campana, Potrero El Plan, 4 km Ote.[W] Carr. PanAmer., 6 Sep 73, lotes producción de semilla [seed-production lots], 1500 m, *Valdés-Reyna* VR-101 (RELC). Potrero El Bajío, 11 km Ote. carr. PanAmer., 18 Sep 73, pastizal halófito [halophyte grassland], 1480 m, *Valdés-Reyna* VR-322 (RELC); Presa Chihuahua, 7 Aug 1975,

vegetación riparia [riparian vegetation], 1550 m, *J.M. Peña JMP-74* (RELC); km 1773 carr. Juárez, 15 Sep 55, pastizal, 1500 m, *Hern.-Xol. & V. Mathus N-1839* (RELC); Chihuahua, 15 Jul 1976, pastizal, 1500 m, *Blanco, Ochoa 45* (MEXU). **Cusihiuriá-chi:** Subida al Cerro [climb hill] de la Bufo, al sur de Cusihiuriá-chi, 10 Aug 1997, bosque de encino-tascate [juniper], 2060 m, *A. Espejo et al. 5750* (MEXU). **Gran Morelos:** 47 mi W of Cd. Chihuahua on hwy 16, 7 Oct 1972, 6000 ft, *L. H. Harvey 9292* (ENCB); km 21 carr. Chih.–Namiquipa (via corta [short]), 24 Sep 1997, bosque de encino, 1830 m, *M.A. Vergara 194* (MEXU). **Ignacio Zaragoza:** Along hwy, 17.9 mi N of Ignacio Zaragoza, 8 Abril 1977, 7000 ft, *Dunn, Bennett, Torke & Wieder 22669* (ENCB). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 27 Aug 1937, 1450 m, *L. H. Harvey 1629* (ENCB, US). **Jiménez:** Sta Eulalia plains, 15 Aug 1885, *E. Wilkinson 54* (US); Banks of Río Florido, Cd. Jiménez, 28 Jul 1939, *L. H. Harvey 1318* (US); along hwy 49 ca. 167 km N of Gómez Palacio, 25 Sep 2004, matorral xerófilo [xerophilous scrub], 1279 m, *R.M. King & R.M. Garvey 13469* (CIIDIR); Reserva de la Biosfera de Mapimí, 1 km de Las Palomas, 6 Jul 1997, matorral xerófilo, 1055 m, *A. García 2636* (CIIDIR); At Papalote Las Juntas (Presón de Antojos) 2 km NW of Hacienda El Berrendo, on Las Pampas ranch, 25 Aug 1972, mezquital, 1450 m, *F. Chiang, T. Wendt & M.C. Johnston 8856* (MEXU); El Hugo, Torreoncitos, 13 Aug 2010, matorral de *Prosopis* sp., 1355 m, *D. Ramírez & M.L. Juárez 3377, 3398* (CIIDIR). **Juárez:** Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadow and irrigation canals], 1120 m, *R. Corral RCD6284* (UACJ); 23 km al S del poblado de Samalayuca, por la carr. Panamericana, 9 Sep 1995, 1250 m, *R. Corral & P. Olivas RCD6345* (UACJ); 23 km al S del poblado de Samalayuca, por la carr. Panamericana, 9 Sep 1995, 1250 m, *R. Corral & P. Olivas RCD6347* (UACJ). **Nuevo Casas Grandes:** 3 km al SE del Rancho Santa María, 7 Oct 1979, *M.A. López s.n.* (ENCB). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino, 1200 m, *A. Benítez 2908* (CIIDIR, MEXU). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7963* (US); **San Francisco De Conchos:** carr. de Aldama a la presa sobre el río [dam on the river] Conchos, 25 Aug 1966, *M.F. Robert s.n.* (ENCB). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, *P.M. Peterson & Annable 8096* (US).

### *Cortaderia* Stapf

Perennial; often dioecious or monoecious; caespitose. Culms erect, densely clumped. Leaves primarily basal; sheaths open, often overlapping, glabrous or hairy; auricles absent; ligules of hairs; blades flat to folded, arching, edges usually sharply serrate. Inflorescences terminal, plumose panicles, subtended by a long, ciliate bract; branches stiff to flexible. Spikelets somewhat laterally compressed, usually unisexual, sometimes bisexual, with 2–9 unisexual florets; disarticulation above the glumes and below the florets. Glumes unequal, nearly as long as the spikelets,

hyaline, 1-veined; calluses pilose; lemmas 3- to 5(7)-veined, long-acuminate, bifid and awned or entire and mucronate; lemmas of pistillate and bisexual florets usually long-sericeous; lemmas of staminate florets less hairy or glabrous; lodicules 2, cuneate and irregularly lobed, ciliate; paleas about  $\frac{1}{2}$  as long as the lemmas, 2-veined; anthers of bisexual florets 3, 1.5–6 mm long, those of the pistillate florets smaller or absent. Caryopsis 1.5–3 mm long.  $x = 9$ .

*Cortaderia*, a genus of 21 species, is native to South America and New Zealand, with the majority of species being South American (Soreng et al., 2017b).

91. *Cortaderia selloana*\* (Schult. & Schult. f.) Asch. & Graebn., Syn. Mitteleur. Fl. 2(1): 325. 1900. *Arundo selloana* Schult. & Schult. f., Mant. 3 (Add. 1): 605. 1827.

FIGURE 72

Plants usually dioecious, sometimes monoecious. Culms 2–4 m tall, usually 2–4 times as long as the panicles. Leaves primarily basal; sheaths mostly glabrous, with a dense tuft of hairs at the collars; ligules 1–2 mm long; blades to 2 m long, 3–8 cm wide, mostly flat, cauline, ascending, arching, bluish-green, abaxial surfaces glabrous basally. Panicles 30–130 cm long, only slightly, if at all, elevated above the foliage, whitish or pinkish when young. Spikelets 15–17 mm long; calluses to 1 mm long, with hairs to 2 mm; lemmas long-attenuate to an awn, awns 2.5–5 mm long; paleas to 4 mm long; stigmas exserted. Caryopsis and florets not separating easily from the rachilla.  $2n = 72$ .

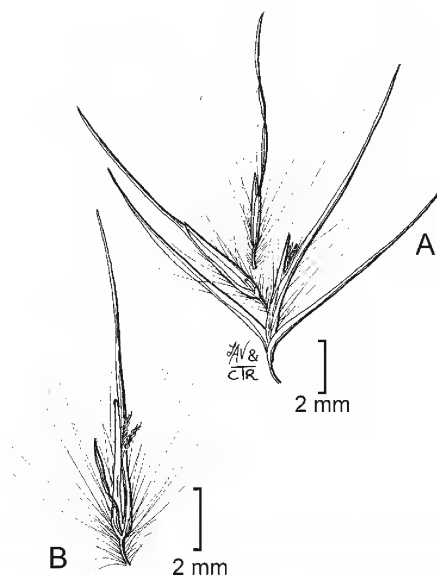


FIGURE 72. *Cortaderia selloana*. A. Spikelet. B. Florets. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



**DISTRIBUTION AND HABITAT.** *Cortaderia selloana* is native to central South America. It is cultivated as an ornamental in the warmer parts of North America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. There are no herbarium specimens of this species, but it is included here because it often found growing as an ornamental in many cities of Chihuahua.

### **Cottea Kunth**

Perennial; caespitose, softly pilose throughout. Culms 25–70 cm tall, ascending or erect from hard knotty bases. Sheaths pilose, rounded on the backs; blades flat, linear; microhairs of blades each with an elongated basal cell and an inflated terminal cell. Inflorescences terminal, open, rather narrow panicles; disarticulation above the glumes and between the florets. Spikelets with 6–10 florets, distal florets reduced. Glumes subequal, about as long as the lowest lemmas, pilose, 7- to 13-veined, midveins sometimes prolonged as short awns, apex acuminate or 3-toothed; lemmas rounded on the backs, with 9–13 prominent veins, some of these excurrent into antrorsely barbed awns of various lengths, others into awned teeth, awns and teeth not forming a pappus-like crown; paleas slightly longer than the lemmas, 2-veined, 2-keeled, keels hairy; anthers 3. Cleistogamous spikelets, usually consisting of a single floret, produced in the lower sheaths.  $x = 10$ .

*Cottea* is a monotypic American genus.

#### **92. *Cottea pappophoroides* Kunth, Révis. Gramin. 1: 84. 1829.**

Culms 25–70 cm tall. Blades 5–15 cm long, 4–7 mm wide. Panicles 8–15 cm long, 2–6 cm wide, green or purplish; branches loosely ascending. Spikelets 5–10 mm (including the awns); glumes 4–5 mm long; lemmas 3–4 mm long, conspicuously long-pilose basally, awns and teeth more or less alternating. Caryopsis about 1.5 mm long, plump, elliptical; embryos about ½ as long as the caryopsis.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Cottea pappophoroides* grows on open hillsides from Arizona and Texas south to central Mexico and from Ecuador to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: SW Chihuahua, Aug 1885, *E. Palmer* 162, 207 (US). Camargo: 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1395 (ENCB, US). Chihuahua: Rocky hills near Chihuahua, 12 Sep 1885, *C.G. Pringle* 420 (ENCB, US); *C.G. Pringle* 534 (US). Cuauhtémoc: 23 mi NW of Zavalza, 3 Oct 1966, 4800 ft, *Reeder & C. Reeder* 4587 (ARIZ, ENCB, MEXU, US). Jiménez: Dunas de arena [sand dunes] La Soledad, Reserva de la Biosfera Mapimí Chihuahua, 21 Sep 1998, matorral xerófilo [xerophilous scrub], 1140 m, *A. García* 3085, 3691 (CIIDIR); 33 mi SE of Jiménez, 27 Sep 1963, *Reeder & C. Reeder* 3848 (ARIZ, US). Matamoros: 24 mi NW of Chihuahua–Durango State line, 3 Sep 1967, 4600 ft, *Reeder & C. Reeder* 4837 (ARIZ, ENCB, MEXU). Mecoqui: 1 km al N del Rancho El Pilar, 26 Oct 1974, *Valdés-Reyna* VR-816 (ENCB); 14 km N of Delicias on

rd from Chihuahua to Delicias, 29 Jun 1974, *S.D. Koch* 74152 (US); 1 km al S del rancho El Pilar, 26 Oct 74, matorral, 1150 m, *Valdés-Reyna* VR-816 (RELC). Ojinaga: Near S end of La Perla–Ojinaga road 6 km N of where it joins the Camargo–Jiménez Hwy and due E of Camargo, 29 Sep 1972, matorral, 1400 m, *F. Chiang, T. Wendt & M.C. Johnston* 9581 (MEXU). Saucillo: Mancomún El Pajarito Domingero, 18 km de las Varas, 10 Oct 1996, matorral, 1280 m, *Fierros* 106 (MEXU); Rancho El Salvador, 10 Oct 1995, matorral, 1300 m, *Fierros* 117 (MEXU).

### **Cynodon Rich.**

Perennial; sometimes stoloniferous, sometimes also rhizomatous, often forming dense turf. Sheaths open; auricles absent; ligules of hairs or membranous; blades flat, conduplicate, convolute, or involute, sometimes disarticulating. Inflorescence terminal, digitate or subdigitate panicles of spikelike branches; branches (1)2–20, 1-sided, with 2 rows of solitary, subsessile, appressed, imbricate spikelets. Spikelets laterally compressed, with 1(3) florets, only the lowest floret functional; rachilla extension usually present, sometimes terminating in a reduced floret; disarticulation above the glumes. Glumes usually shorter than the lemmas, membranous, keeled, usually muticous; lower glumes 1-veined; upper glumes 1- to 3-veined, occasionally shortly awned; lemmas membranous to cartilaginous, 3-veined, keeled, keels with hairs, occasionally winged, apex mucronate or muticous; paleas about as long as the lemmas, 2-keeled; anthers 3; style branches 2, plumose; lodicules 2.  $x = 9$ .

*Cynodon* is a genus of nine species, all of which are native to tropical regions of the Eastern Hemisphere. Several species are used as lawn and forage grasses in tropical and warm-temperate regions. The most widespread species, *C. dactylon*, is also the only one encountered in Chihuahua.

#### **93. *Cynodon dactylon*\* (L.) Pers., Syn. Pl. 1: 85. 1805. *Panicum dactylon* L., Sp. Pl. 58. 1753.**

FIGURE 73

Plants stoloniferous, usually also rhizomatous. Culms 5–40(50) cm tall, not becoming woody. Sheaths glabrous or with scattered hairs; collars usually with long hairs, particularly at the margins; ligules about 0.5 mm long, of hairs; blades 1–6(16) cm long, (1)2–4(5) mm wide, flat at maturity, conduplicate or convolute in bud, glabrous or the adaxial surfaces pilose. Panicles with (2)4–6(9) branches; branches 2–6 cm long, in a single whorl, axes triquetrous. Spikelets 2–3.2 mm long; lower glumes 1.5–2 mm long; upper glumes 1.4–2.3 mm long; lemmas 1.9–3.1 mm long, keels not winged, pubescent, margins usually less densely pubescent; anthers dehiscent at maturity; paleas glabrous.  $2n = 18, 36$ .

**DISTRIBUTION AND HABITAT.** *Cynodon dactylon* is from temperate regions of the Old World, introduced in America and widely distributed in Canada, United States, Mexico, Central and South America, and the Caribbean Islands.





FIGURE 73. *Cynodon dactylon*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Al-dama:** km 91 carr. [hwy] Chihuahua–Ojinaga, 29 Aug 1978, matorral [scrub], 1395 m, *Molinar, Baray, Rodríguez* 68 (MEXU). **Ascensión:** alrededores del cruce del río [around river crossing] Casas Grandes con la carr. Juárez–Ascensión, 11 Jun 2005, 1180 m, *R. Corral, M. Vargas & H. Gutiérrez* RCD7156 (UACJ). **Camargo:** 5 km W of Cd. Camargo, 5 Aug 1939, 1220 m, *L. H. Harvey* 1410 (ENCB). **Chihuahua:** Rancho Experimental La Campana, 16 Oct 1980, pastizal [pastureland], 1640 m, *A. Melgoza* 621 (CIIDIR); La Campana, 24 Sep 76, Jardín de observación [observation garden], 1500 m, *S. González* 778 (RELC). **Delicias:** 14 km al N of Delicias on road from Chihuahua to Delicias, 29 Jun 1974, weedy vegetation in irrigated area, *S.D. Koch* 74152 (US). approx. 3 mi S of Delicias on Mex 45; 30 Mar 1971, 4200 ft, *W.E. Harmon & Dunn* 5381 (ENCB). **Jiménez:** along hwy 49, ca 167 km N of Gómez Palacio, 25 Sep 2004, 1279 m, *R.M. King & R.M. Garvey* 13467 (CIIDIR); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez & M.L. Juárez* 3389 (CIIDIR). **Juárez:** Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadows and irrigation canals], 1120 m, *R. Corral* RCD6296 (UACJ); km 40 carr. No. 2, a los lados [sides] del canal de riego, 8 Sep 1994, 1100 m, *R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez* RCD5432 (UACJ); Ciudad Juárez a lo largo [along] de la “Asequia Madre” desde la intersección de las calles [from the intersection of streets] Mejía & Santos Degollado, hasta el túnel bajo [below the tunnel] el Viaducto Díaz Ordaz, 3 Jun 1995, 1140 m, *R. Corral & L.M. Barraza* RCD6112 (UACJ); Ciudad Juárez a lo largo de la “Asequia Madre” al N del fracc. Rincones de San Marcos, 13 Oct 1995, 1140 m, *R. Corral, P. Olivas & L.M. Barraza* RCD6544 (UACJ); en campos [fields] de la Univ. Autónoma de Cd. Juárez, edificio [building] ICB, 15 Abr [Apr] 2005, *R. Corral, M. Vargas & D. Alvarado* RCD7103 (UACJ). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 10.6 km from the Cahuisori–Ocampo road on the road to Candamena, at Cruz Verde, 23 Sep 1994, 1920 m, *Spellenberg, Corral & Estrada* 12114 (NMC). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of hwy 45, N of Chihuahua, 22 Sep 1988, grassland, 1700 m, *P.M. Peterson & Annable* 5772 (US).

### *Dactylis* L.

**Perennial;** caespitose, sometimes with short rhizomes. **Culms** to 2.1+ m, bases laterally compressed; **internodes** hollow; **nodes** glabrous. **Leaves** mostly basal, glabrous; **sheaths** closed for at least  $\frac{1}{2}$  their length; **auricles** absent; **ligules** membranous; **blades** flat to folded. **Inflorescences** panicles; **primary branches** 1-sided, naked proximally, with dense clusters of sessile spikelets distally, at least some branches longer than 1 cm. **Spikelets** oval to elliptic in outline, laterally compressed, with 2–6 florets; **rachillas** glabrous, not prolonged beyond the distal floret; **disarticulation** above the glumes and beneath the florets. **Glumes** shorter than the florets, lanceolate, 1- to

3-veined, ciliate-keeled, awn-tipped; **calluses** short, blunt; **lemmas** 5-veined, scabrous to ciliate-keeled, tapering to a short awn; **paleas** 2-keeled, tightly clasped by the lemmas, unawned, apex notched; **lodicules** 2, glabrous, toothed; **anthers** 3; **ovaries** glabrous. **Caryopsis** shorter than the lemmas, concealed at maturity, oblong to ellipsoid, falling free or adhering to the lemma and/or palea; **hila** round.  $x = 7$ .

*Dactylis* is interpreted here as a variable monotypic genus, although five species are recognized by Russian taxonomists. Numerous infraspecific taxa have been recognized in Eurasia where *Dactylis* is native, but it does not seem feasible to identify subspecies and varieties in North America.

94. *Dactylis glomerata*\* L., Sp. Pl. 71 (1753).

FIGURE 74

**Culms** to 2.1 m tall, erect. **Leaves** dark green; **sheaths** longer than the internodes, glabrous, usually keeled; **ligules** 3–11 mm long, truncate to acuminate; **blades** (2)4–8(10) mm wide, elongate, lax, with a conspicuous midrib and white, scaberulous to scabrous margins. **Panicles** 4–20 cm long, typically pyramidal, lower branches spreading, upper branches appressed. **Spikelets** 5–8 mm long, subsessile; **glumes** 3–5 mm long; **lemmas** 4–8 mm long, scaberulous; **paleas** slightly shorter than the lemmas; **anthers** 2–3.5 mm long.  $2n = 14, 21, 27–31, 42$ .

**DISTRIBUTION AND HABITAT.** *Dactylis glomerata* grows in pastures, meadows, fence rows, roadsides, and similar habitats throughout North America. Native to Eurasia and Africa, it has been introduced throughout most of the cool-temperate regions of the world as a forage grass.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Juárez:** Universidad Autónoma de Ciudad Juárez, Campus ICB, 15 Abr [Apr] 2005, 1118 m, R. Corral, M. Vargas & D. Alvarado RCD7084 (UACJ); **Chihuahua:** La Campana, 24 Sep 76, Jardín de observación [observation garden], 1500 m, S. González 772 (RELC).

### *Dactyloctenium* Willd.

Annual or perennial; tufted, stoloniferous, or rhizomatous. Culms erect or decumbent, often rooting at the lower nodes, not branching above the base. Sheaths not overlapping, open, keeled; auricles absent; ligules membranous, membranous and ciliate, or of hairs; blades flat or involute. Inflorescences terminal, panicles of 2–11, digitately arranged spicate branches; branches extending beyond the spikelets, terminating in a point, the spikelets imbricate in 2 rows on the lower sides. Spikelets with 3–7 bisexual florets, additional sterile florets distally; disarticulation usually above the glumes, the florets falling as a unit. Glumes unequal, shorter than the adjacent lemmas, 1-veined, keeled; lower glumes acute, mucronate; upper glumes subapically awned, awns curved; calluses glabrous; lemmas membranous, glabrous, 3-veined (lateral veins sometimes indistinct), strongly keeled, apex entire, mucronate, or awned; paleas glabrous; anthers 3, yellow; ovaries

glabrous; styles fused. Fruit utricles; seeds falling free of the hyaline pericarp, transversely rugose or granular.  $x = 10$ .

*Dactyloctenium* is primarily an African and Australian genus of 13 species (Soreng et al., 2017b).

95. *Dactyloctenium aegyptium*\* (L.) Willd., Enum. Pl. 2: 1029. 1809. *Cynosurus aegyptius* L., Sp. Pl. 72. 1753.

FIGURE 75

Plants tufted annuals or short-lived, shortly stoloniferous perennials. Culms 10–35(100) cm tall, usually geniculately ascending and rooting at the lower nodes. Sheaths keeled, with papillose-based hairs distally; ligules 0.5–1.5 mm long, membranous, ciliate; blades 5–22 cm long, 2–8(12) mm wide, with papillose-based hairs. Panicles with (1)2–6(8) digitately arranged spicate branches; branches 1.5–6 cm long, only the first few spikelets in contact with the spikelets of adjacent branches; branch axes extending beyond the spikelets for 1–6 mm. Spikelets 3–4.5 mm long, about 3 mm wide; glumes 1.5–2 mm long; lower glumes ovate, acute; upper glumes oblong elliptic, obtuse, awned, awns 1–2.5 mm long; lemmas 2.5–3.5 mm long, ovate, midveins extended into curved mucros 0.5–1 mm long; paleas about as long as the lemmas; anthers 0.5–0.8 mm long, pale yellow. Seeds cuboid, about 1 mm long and wide, transversely rugose, light tan to reddish-brown.  $2n = 20, 36, 40, 45, 48$ .

**DISTRIBUTION AND HABITAT.** *Dactyloctenium aegyptium* is a widely distributed weed of disturbed sites in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 73 (US). **Ojinaga:** 31 km a Chihuahua, 28 Aug 1978, área agrícola [agricultural area], 1235 m, Molinar, Rodríguez, Baray 49 (MEXU).

### *Dasyochloa* Willd. ex Rydb.

Perennial; stoloniferous, sometimes mat-forming. Culms initially erect, eventually bending and rooting at the base of the inflorescence. Leaves not basally aggregated on the primary culms; sheaths with a tuft of hairs to 2 mm long at the throat; ligules of hairs; blades involute. Inflorescence terminal, short, dense panicles of spike-like branches in a tight capitate cluster, each subtended by leafy bracts and exceeded by the upper leaves; branches with 2–4 subsessile to shortly pedicellate spikelets. Spikelets laterally compressed, with 4–10 florets; disarticulation above the glumes. Glumes subequal to the adjacent lemmas, glabrous, 1-veined, rounded or weakly keeled, shortly awned to mucronate; florets bisexual; lemmas rounded or weakly keeled, densely pilose on the lower ½ and on the margins, thinly membranous, 3-veined, 2-lobed, lobes about ½ as long as the lemmas and obtuse, midveins excurrent into awns as long as or longer than the lobes, lateral veins not excurrent; paleas about as long as the lemmas; anthers 3. Caryopsis oval in cross section, translucent; embryos more than ½ as long as the caryopsis.  $x = 8$ .

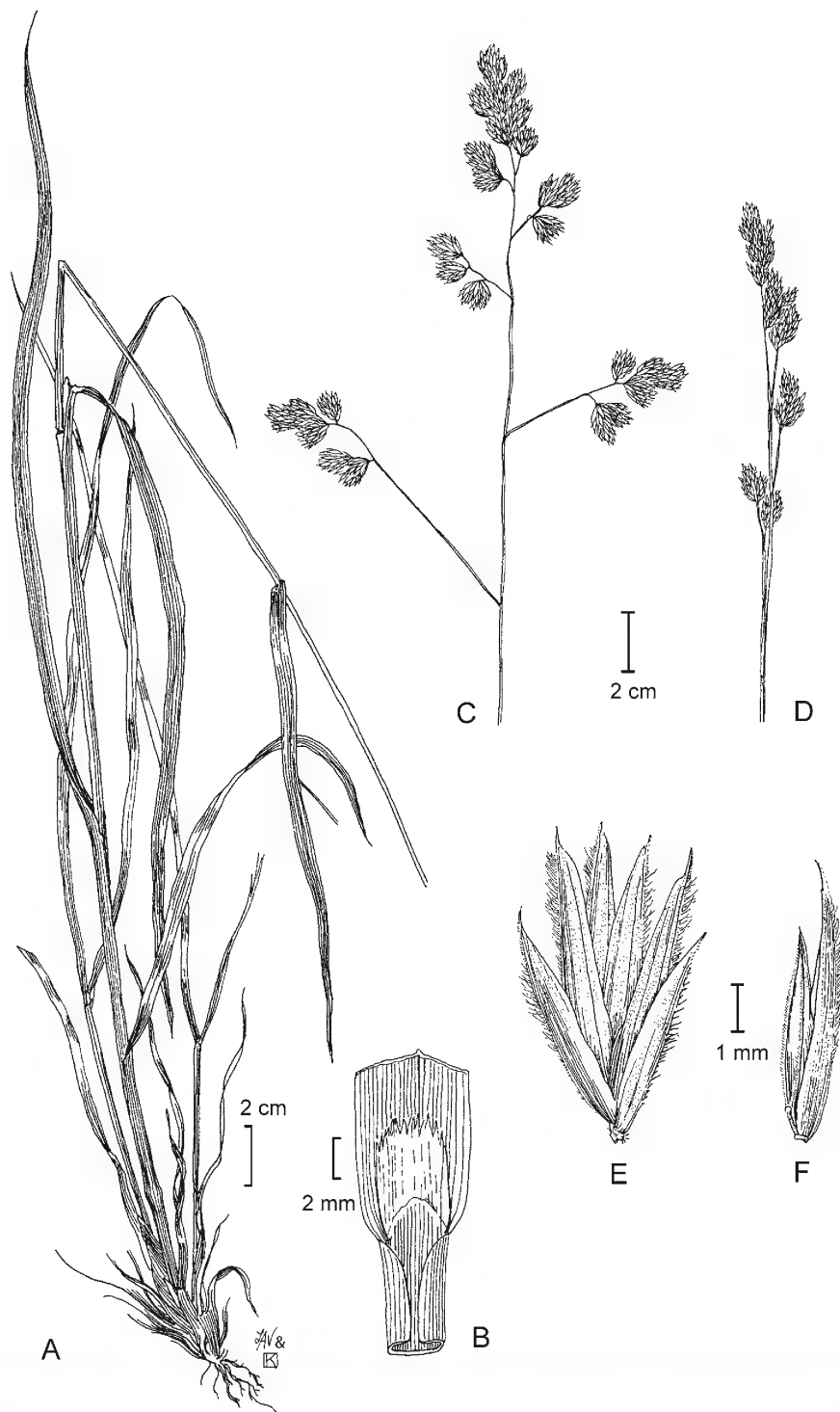
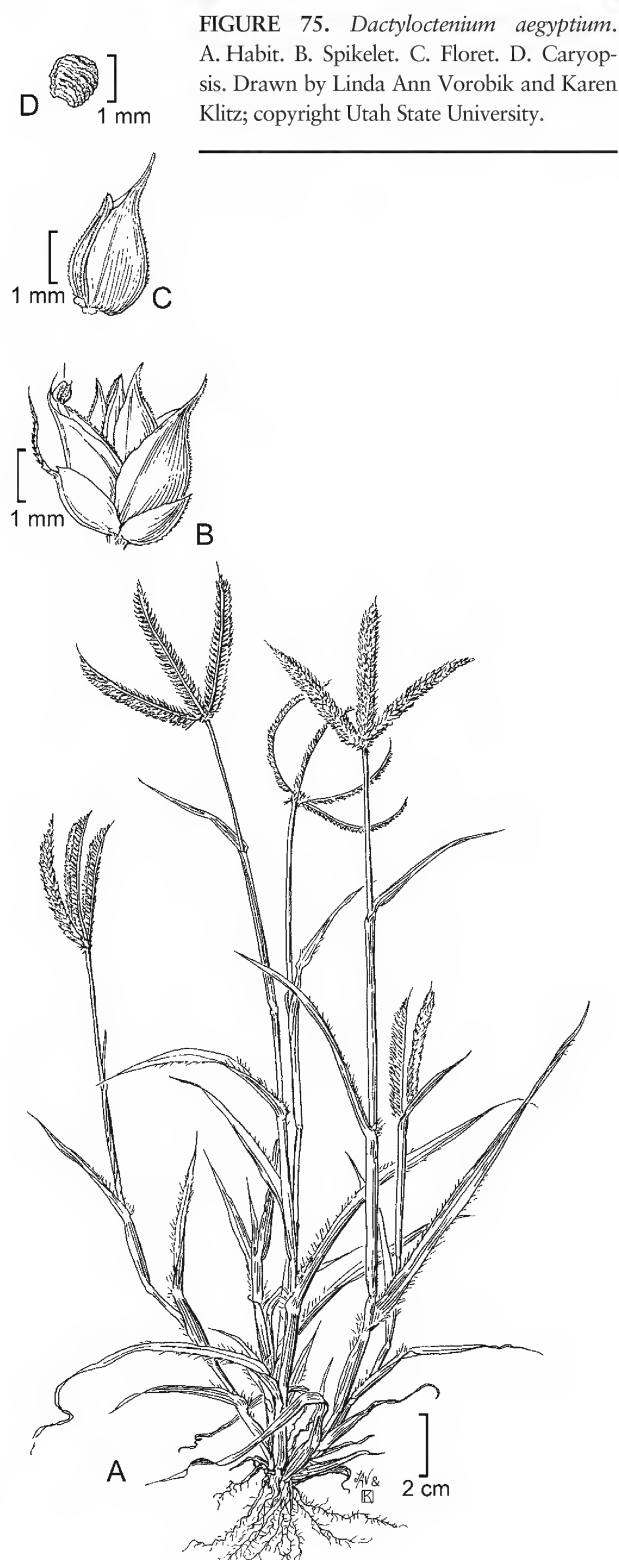


FIGURE 74. *Dactylis glomerata*. A. Habit. B. Ligule. C. Inflorescence. D. Inflorescence branch. E. Spikelet. F. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

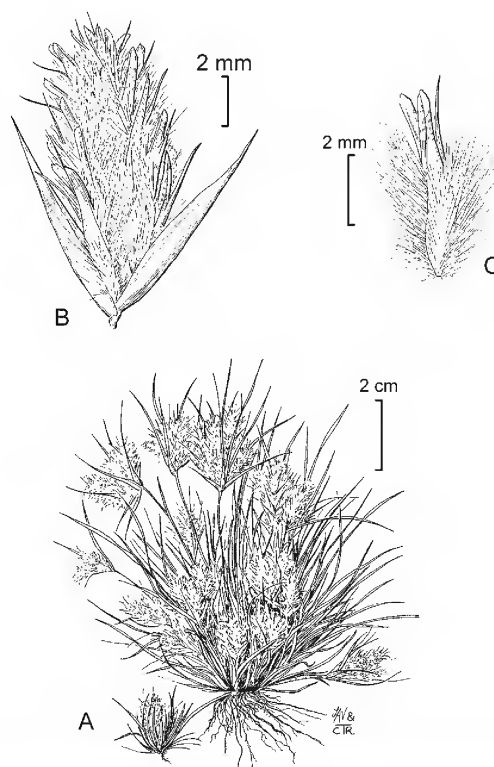


*Dasyochloa* is a monotypic genus that is endemic to North America. It has been included in each of the following genera: *Munroa*, *Triodia*, *Tridens*, and *Erioneuron*.

96. *Dasyochloa pulchella* (Kunth) Willd. ex Rydb., Agric. Exp. Sta. Agric. Colorado Bull. 100: 18, 37. 1906. *Triodia pulchella* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 155–156, t. 47. 1815. *Tridens pulchellus* (Kunth) Hitchc., Fl. Calif. 1: 141. 1912. *Erioneuron pulchellum* (Kunth) Tateoka, Amer. J. Bot. 48(7): 572. 1961. *Munroa pulchella* (Kunth) L. D. Am-  
arilla, Darwiniana, n. s. 1(2): 245. 2013.

FIGURE 76

Culms (1)4–15 cm long, scabrous or puberulent; peduncles (internode below the panicles) 3–7(11) cm. Sheaths striate, margins scarious; ligules 3–5 mm long; blades (1)2–6 cm long, ab-  
axial surfaces scabrous, adaxial surfaces scaberulous. Panicles 1–2.5 cm long, 1–1.5 cm wide, densely white-pubescent, light green or purple-tinged. Spikelets (5)6–9(10) mm long, with (4)6–10 florets; lower glumes 6–8.5 mm long; upper glumes 6.5–9 mm long, as long as or longer than the florets; lemmas



3–5.5 mm long, lobes (1)3–3.2 mm long, midveins excurrent into straight awns (1.5)2.5–4 mm long; paleas 2–3.5 mm long, keels long pilose proximally, ciliate distally; anthers 0.2–0.5 mm long. Caryopsis 1–1.5 mm long, translucent.  $2n = 16$ .

**DISTRIBUTION AND HABITAT.** *Dasyochloa pulchella* grows in rocky soils of arid regions. Its range extends from the western United States southward to central Mexico. It is the most common grass in the *Larrea–Flourensia* scrub of the Chihuahuan Desert, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** NE of Aldama along Chihuahua hwy 16, 15 Sep 1972, *J. Henrickson* 7501, 7628 (US). Juárez: 41.2 mi S of US–Mexican border on Mex 45, 29 Mar 1971, matorral xerófilo [xerophilous scrub], 1300 m, *Harmon, Cox & Dunn* 5309 (ENCB); 43.7 mi NE of Aldama along Hwy 16 (km 96.5) in low clay roadside ditch, 15 Sep 1972, 1500 m, *J. Henrickson* 7928 (ARIZ). **Ascensión:** a los lados de la carr. [sides of hwy] Juárez–Janos, en los alrededores de la [around] Falla del Camello, área de transición de la plataforma del desierto & la depresión [old transition between desert platform and depression] del paleo, 1 Aug “Cabeza de Vaca”, 11 Oct 2005, 1180 m, *R. Corral, M. Vargas & H. Gutiérrez* RCD7175 (UACJ). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1399 (US). **Chihuahua:** Chihuahua, 3–4 Sep 1935, *LeSueur Mex-011* (US); near Chihuahua, 22 May 1885, *C.G. Pringle* 496 (US); 13 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1585 m, *Soderstrom* 911 (US); Carr. Chih.–Delicias km 18 entronque [junction] a Mapula, 29 Sep 1995, pastizal [pastureland], 1520 m, *Quiñones* 98 (MEXU). **Coyame:** 17 mi ENE de Coyame along Hwy 16 at base of limestone hill near Sierra del Cuchillo Parado, 16 Sep 1972, matorral, 3400 ft, *J. Henrickson* 7689 (MEXU). **Cuauhtémoc:** 16 mi NW of Zavalza, 3 Oct 1966, *Reeder & C. Reeder* 4585 (US). **Jiménez:** Sta Eulalia, 21 Jul 1885, *E. Wilkinson* 46 (US); W slope of Sierra de Sta Eulalia, 18 Aug 1939, *L. H. Harvey* 1529 (US); 50 km N of Jimenez, 1 Aug 1939, *L. H. Harvey* 1364 (US); along hwy 49 ca. 167 km N of Gómez Palacio, 25 Sep 2004, 1279 m, *R.M. King & R.M. Garvey* 13468 (CIIDIR). **Juárez:** 41.2 mi S of US–Mexican border on Mex 45, 29 Mar 1971, 4325 ft, *W.E. Harmon & Dunn* 5309 (ENCB); 14.5 mi S of Samlayuca along Hwy 45, ca 46

mi S of Cd Juárez, 20 Aug 1971, 1300 m, *J. Henrickson* 5793 (NMC); km 32 Juárez, 13 Oct 1997, matorral de gobernadora [governor’s scrub], *I. Enríquez, S. Ordoñez & J. Leyva* IEA2 (UACJ). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, *P.M. Peterson & Annable* 5978 (ENCB, US). **Meoqui:** Cerca de [near] Felipe Ángeles, 31 Jul 1976, matorral de *Larrea–Fouquieria–Cassia*, 1330 m, *S. González & J.M. Peña* 391 (ENCB). **Nuevo Casas Grandes:** 27.4 km S of Nuevo Casa Grandes on Mex 2, 28 Sep 1989, oak woods, 1585 m, *P.M. Peterson & R.M. King* 8145 (ENCB, MEXU). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, *P.M. Peterson & Annable* 8094 (ENCB).

### *Deschampsia* P. Beauv.

Plants usually perennial, some annual; caespitose or tufted. Culms 5–140 cm tall, hollow, erect. Leaves mainly basal, often forming a dense tuft; sheaths open; ligules membranous, decurrent, rounded to acuminate; blades often all or almost all tightly rolled or folded and some flat, sometimes most flat. Inflorescences terminal panicles, open or contracted, disarticulation above the glumes, beneath the florets. Spikelets 3–9 mm long, with 2(3) florets in all or almost all spikelets, florets usually bisexual, sometimes viviparous; rachillas hairy, usually prolonged more than 0.5 mm beyond the base of the distal floret, sometimes terminating in a highly reduced floret. Glumes subequal to unequal, usually exceeding the adjacent florets, often exceeding all florets, 1- or 3-veined, acute to acuminate; calluses antrorsely strigose; lemmas obscurely (3)5- to 7-veined, rounded over the back, apex truncate-erose to 2- to 4-toothed, awned, awns usually attached on the lower ½ of the lemmas, occasionally subapical, straight to strongly geniculate, slightly to strongly twisted proximally, straight distally; paleas shorter than the lemmas, 2-keeled, keels often scabrous; lodicules 2, lanceolate to ovate-lanceolate, usually entire; anthers 3; ovaries glabrous; styles 2. Caryopsis oblong; embryos about ¼ the length of the caryopsis.  $x = 7$ .

*Deschampsia* includes 20–40 species. It is best represented in the Americas and Eurasia and grows in cool, damp habitats throughout the world. Two species are native to Chihuahua.

### KEY TO SPECIES OF *DESCHAMPSIA*

1. Plants annual; leaves not forming a basal tuft; awns 4–9 mm long, strongly geniculate ..... *D. danthonioides*
1. Plants perennial; leaves sometimes forming a basal tuft; awns 1.5–5.5(6) mm long, straight to slightly geniculate ..... *D. elongata*

97. *Deschampsia danthonioides* (Trin.) Munro, Pl. Hartw. 342. 1857.

FIGURE 77

Annual. Culms 10–40(70) cm tall, erect. Leaves not forming a basal tuft; ligules (0.5)2–3(4.7) mm long, acute to acuminate, entire; blades 0.3–1.5 mm wide, involute or flat. Panicles

5–15(25) cm long, 2–8 cm wide, contracted to open, erect; branches with the spikelets confined to the distal portion. Spikelets 4–9 mm long, bisexual, narrowly V-shaped, usually pale green; glumes exceeding the distal florets, glabrous to scabrous, 3-veined; lower glumes 4–9 mm long; upper glumes 3.5–8.5 mm long; callus hairs 0.4–1.6 mm long; lemmas 1.5–3 mm long, smooth, shiny, glabrous, pale green or purplish, apex blunt,



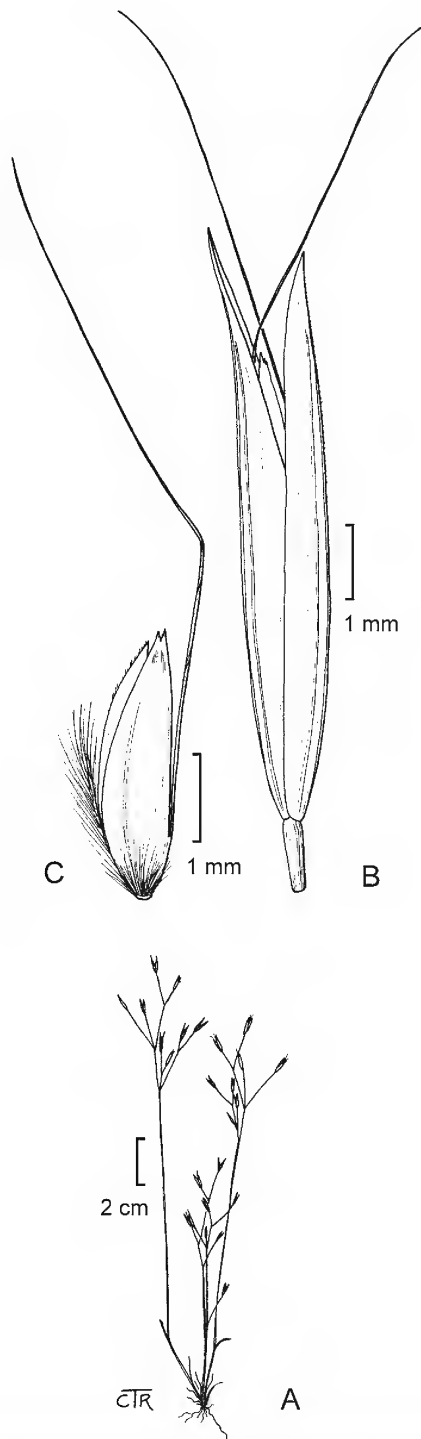


FIGURE 77. *Deschampsia danthonioides*. A. Habit. B. Spikelet. C. Floret. Drawn by Cindy Roché; copyright Utah State University.

erose to 4-toothed, ciliate, the awns 4–9 mm long, attached from near the base to about the middle of the lemmas, strongly geniculate, geniculate above the lemma apex, distal segment 1.5–5 mm long; anthers 0.3–0.5 mm long.  $2n = 26$ .

**DISTRIBUTION AND HABITAT.** *Deschampsia danthonioides* grows in temperate and cool-temperate regions, usually in open, wet to dry habitats and often in disturbed ground. Its primary range extends from southern British Columbia to Washington and Idaho, south to Baja California, Mexico. The species has recently been collected in Chihuahua. It also occurs, as a disjunct, in Chile and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Gómez Farías: Laguna de Babicora, 18 Aug 1994, 2150 m, T. Lebgue & E. Estrada 3324 (NMC).

98. *Deschampsia elongata* (Hook.) Munro, Pl. Hartw. 342. 1857.

FIGURE 78

Plants perennial; densely caespitose. Culms (10)30–120 cm tall. Leaves sometimes forming a basal tuft; sheaths glabrous; ligules 2.5–8(9) mm long, acute to acuminate; blades 7–30 cm long, 0.2–2 mm wide, usually involute. Panicles 5–30(35) cm long, 0.5–1.5(2) cm wide, erect or nodding; branches erect to ascending. Spikelets 3–6.7 mm long, bisexual, narrowly V-shaped, appressed to the branches; glumes equaling or exceeding the florets, narrowly lanceolate, usually pale green, sometimes purple-tipped, 3-veined, acuminate; lower glumes (3)3.2–5.5(6.7) mm long; upper glumes (3)3.1–5.4(6) mm long; callus hairs 0.3–1.15 mm long; lemmas 1.7–4.3 mm long, smooth, shiny, glabrous, apex weakly toothed or erose, awns 1.5–5.5(6) mm long, straight to slightly geniculate, attached from slightly below to slightly above the middle of the lemma, exceeding the florets by 1–2.5 mm; anthers 0.3–0.5(0.7) mm long.  $2n = 26$ .

**DISTRIBUTION AND HABITAT.** *Deschampsia elongata* grows in moist to wet habitats from near sea level to alpine elevations from Alaska and the Yukon south to northern Mexico and east to Montana, Wyoming, and Arizona. It also grows as a disjunct in Chile.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Ocampo: Parque Nacional “Cascada de Basaseachic,” 25 Abr [Apr] 1986, 1700 m, Spellenberg, R. Soreng, R. Corral & T. Lebgue 8474 (NMC).

### *Dichanthelium* (Hitchc. & Chase) Gould

Perennial; caespitose, sometimes rhizomatous, sometimes with hard, cormlike bases, often with basal winter rosettes of leaves having shortly ovate to lanceolate blades, these often sharply distinct from the blades of the cauline leaves. Culms herbaceous, hollow, usually erect or ascending, rarely sprawling, in the spring often spreading; branches rebranching 1–4 times. Cauline leaves 3–14, usually distinctly longer and narrower than the rosette blades; ligules of hairs, membranous, ciliate, sometimes

absent; pseudoligules of 1–5 mm hairs often present at the bases of the blades immediately behind the true ligules; blades usually distinctly longer and narrower than those of the basal rosette. Inflorescence panicles, terminal on the culms and branches; sterile branches and bristles absent; disarticulation below the glumes. Spikelets 0.8–5.2 mm long, not subtended by bristles, dorsally compressed, surfaces unequally convex, apex unawned. Glumes apex not or only slightly gaping at maturity; lower glumes  $\frac{1}{5}$ – $\frac{3}{4}$  as long as the spikelets, 1- to 5-veined, truncate, acute, or acuminate; upper glumes slightly shorter than the spikelets or exceeding the upper florets by up to 1 mm long, 5- to 11-veined, not

saccate, apex rounded to attenuate. Lower florets sterile or staminate; lower lemmas similar to the upper glumes; lower paleas sometimes present, thin, shorter than the lower lemmas; upper florets bisexual, sessile, plump, usually apiculate to mucronate, sometimes minutely so, or subacute to (rarely) acute; upper lemmas striate, chartaceous-indurate, shiny, usually glabrous, margins involute; upper paleas striate; anthers 3. Caryopsis smooth; pericarp thin.  $x = 9$ .

*Dichanthelium* is a genus of approximately 62 species, 2 of which are present in Chihuahua. It is often included in *Panicum* sensu lato, the two taxa being similar in gross morphology.

#### KEY TO SPECIES OF *DICHANTHELIUM*

1. Spikelets 2.7–4.2 mm long; blades basally narrow ..... *D. oligosanthos*  
 1. Spikelets 1.4–1.8 mm long; blades basally chordate ..... *D. sphaerocarpon*

99. *Dichanthelium oligosanthos* (Schult.) Gould, Brittonia 26(1): 60. 1974. *Panicum oligosanthos* Schult., Mant. 2: 256. 1824.

Plants caespitose, with caudices. Basal rosettes well-differentiated; blades 2–6 cm long, few, ovate to lanceolate. Culms 20–75 cm tall, geniculate basally, stiffly erect distally; nodes glabrous or sparsely pubescent; internodes often purplish, glabrous, puberulent, or papillose-hirsute; fall phase branching from the midculm nodes, branches initially ascending to erect, sometimes developing simultaneously with and overtopping the primary panicles, later rebranching to form short, bushy clumps of blades and small, included secondary panicles. Cauline leaves 5–7; sheaths not overlapping, glabrous, puberulent, or ascending papillose-hispid, margins ciliate, collars loose, puberulent; ligules 1–3 mm long, of hairs; blades 5–12 cm long, 4–15 mm wide, flat or partly involute, glabrous or pubescent abaxially, with 7–9 major veins only slightly more prominent than the minor veins, bases ciliate, rounded to truncate, margins cartilaginous. Primary panicles 5–9 cm long, 3–6 cm wide, partly enclosed to long-exserted, with 6–60 spikelets; branches stiff or wiry, puberulent or scaberulous. Spikelets 2.7–4.2 mm long, 1.7–2.4 mm wide, ellipsoid to broadly obovoid, turgid, glabrous or sparsely pubescent; lower glumes 1–1.6 mm long, acute, similar in texture and vein prominence to the upper glumes; upper glumes strongly veined, often orange to purplish at the base; lower florets sterile; upper florets with minutely umbonate apex.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Dichanthelium oligosanthos* grows throughout the southern United States and extends into northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Divisadero Overlook of Cascada de Basaseachic, on trail below overlook, 23 Jun 1987, 2100 m, T.R. Van Devender, R.K. Van Devender, P.S. Martin 87-151 (NMC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” in the barranca [canyon] at the base of the falls, 11 Nov 1989, 1700 m, Spellenberg, R. Corral, T. Lebgue & M. Mahrt 10073 (CIIDIR, NMC);

100. *Dichanthelium sphaerocarpon* (Elliott) Gould, Brittonia 26(1): 60. 1974. *Panicum sphaerocarpon* Elliott, Sketch Bot. S. Carolina 1(2): 125. 1816.

Plants caespitose. Basal rosettes well-differentiated; blades 2–6 cm long, about 1 cm wide, ovate, the uppermost leaves often resembling the lower cauline blades. Culms 15–50 cm tall, few together, decumbent or ascending, light green, glabrous, slightly fleshy or thickened; fall phase branching mostly near the bases, with sparse branching; nodes appressed-pubescent or glabrous. Cauline leaves 3–4(6); sheaths sometimes overlapping near the bases, glabrous, margins ciliate; ligules almost obsolete, or of 0.2–0.8 mm hairs from a tiny membranous base; blades 1.5–10 cm long, 5–14 mm wide, thick, light green, faintly veined, bases cordate, with papillose-based cilia, margins white, cartilaginous. Primary panicles 4–14 cm long, more than  $\frac{1}{2}$  as wide as long, usually long-exserted. Spikelets 1.4–1.8 mm long, broadly obovoid-spherical, usually puberulent, sometimes glabrous; lower glumes 0.4–0.8 mm long, acute to obtuse; upper florets 1.1–1.5 mm long, broadly ellipsoid, blunt.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Dichanthelium sphaerocarpon* grows in dry, open woods and roadsides. Its range extends from eastern North America to Ecuador and Venezuela.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ocampo:** Cascadas de Basaseachic, 6 Jul 1936, LeSueur Mex-0105 (US); Parque Nacional “Cascada de Basaseachic,” 0.5 km up the Rio Durazno from the camp area near the parking lot at the head of the falls, 1 Aug 1988, 2000 m, Spellenberg, R. Corral, J. Brunt & L. Huemeke 9644 (NMC); Parque Nacional “Cascada de Basaseachic,” in the barranca [canyon] at the base of the falls, 11 Nov 1989, 1700 m, Spellenberg, R. Corral, T. Lebgue & M. Mahrt 10072 (NMC).

#### *Dichanthium* Willem.

Annual or perennial; caespitose, sometimes with extensive creeping stolons. Leaves usually not aromatic; ligules

membranous, sometimes ciliate. Inflorescence terminal, sometimes also axillary but the axillary inflorescences not numerous; peduncles with 1 to many rames in digitate or subdigitate clusters; rames sometimes naked basally, axes terete to slightly flattened, without a translucent, longitudinal groove, bearing 1 to many sessile-pedicellate spikelet pairs and a terminal triplet of 1 sessile and 2 pedicellate spikelets, basal pair(s) homomorphic and homogamous, staminate or sterile, unawned, persistent, distal spikelet pairs homomorphic but heterogamous, sessile spikelets bisexual and awned, pedicellate spikelets staminate or sterile and unawned; disarticulation in the rames, beneath the bisexual sessile spikelets. Sessile spikelets often imbricate, dorsally compressed, with blunt calluses; lower glumes chartaceous to cartilaginous, broadly convex to slightly concave, sometimes pitted; lower florets reduced, sterile; upper florets sterile or staminate and unawned in the homogamous pairs, bisexual and awned in the heterogamous pairs; awn usually glabrous; anthers (2)3. Pedicels free of the rame axes, terete to somewhat flattened, slender, not grooved. Pedicellate spikelets sterile or staminate.  $x = 10$ .

*Dichanthium*, a genus of 20 species, grows in habitats ranging from subdeserts to marshlands in tropical Asia and Australia. Introduced in America.

101. *Dichanthium annulatum*\* (Forssk.) Stapf, Fl. Trop. Afr. 9: 178. 1917. *Andropogon annulatus* Forssk., Fl. Aegypt-Arab. 173. 1775.

Perennial; stoloniferous. Culms to 100 cm tall, decumbent, erect portions generally to 60 cm long, often branched above the bases, glabrous beneath the inflorescences; nodes glabrous or short-pubescent. Sheaths glabrous; ligules 1–1.8 mm long, truncate; blades 3–30 cm long, 2–7 mm wide, scabrous, sparsely pilose, hairs sometimes papillose-based. Rames 2–9, 2.5–7 cm long, subdigitate, erect to ascending, bases without spikelets, glabrous, internodes ciliate on the margins. Sessile spikelets 2.5–5 mm long, 1–1.5 mm wide; lower glumes elliptic or oblong, sparsely pubescent below, apex obtuse, irregularly 2- to 3-toothed, 5- to 9-veined; upper glumes 3-veined; awns 1.3–2.2 cm long, twice-geniculate. Pedicellate spikelets 2.5–5 mm long, usually staminate.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Dichanthium annulatum* is native to southeastern Asia and is a highly esteemed forage grass, especially in India. It is now established at scattered locations in northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

### *Digitaria* Haller

Annual, perennial, or of indefinite duration. Culms erect or decumbent, branching basally or at aerial culm nodes, when annual or of indefinite duration usually decumbent and rooting at the lower nodes. Sheaths open; ligules membranous, sometimes ciliate; blades usually flat. Inflorescences terminal, sometimes also axillary, usually panicles of 1-sided spike-like branches (sometimes only 1 branch) attached digitately or racemously to a rachis, sometimes simple panicles of solitary, pedicellate spikelets; spike-like branches, if present, sometimes with secondary branches, primary branch axes triquetrous, bearing spikelets abaxially, in 2 rows, usually in unequally pedicellate groups of 2–5, occasionally borne singly. Spikelets lanceoloid to ellipsoid, dorsally compressed, apex obtuse to acuminate, unawned, with 2 florets; disarticulation beneath the glumes. Lower glumes absent or to  $\frac{1}{4}$  as long as the spikelets; upper glumes usually from  $\frac{1}{6}$  as long as to equaling the spikelets, occasionally absent, 0- to 5-veined, usually pubescent; lower florets sterile; lower lemmas membranous, usually as long as the upper lemmas, usually pubescent, (3)5- to 7(13)-veined; lower paleas absent or reduced; upper lemmas mostly stiffly chartaceous to cartilaginous, obscurely veined, with hyaline margins that embrace the upper paleas; upper paleas similar to the upper lemmas in texture and size; lodicules 3, cuneate; anthers 3. Caryopsis plano-convex; embryos  $\frac{1}{5}$ – $\frac{1}{2}$  as long as the caryopsis; hila punctiform to ellipsoid.  $x = 9$ .

*Digitaria* has approximately 200 species and grows primarily in tropical and warm-temperate regions, often in disturbed, open sites.

### KEY TO SPECIES OF *DIGITARIA*

1. Inflorescence a diffuse panicle ..... *D. cognata*
1. Inflorescence with 2 or several spiciform branches.
  2. Spikelets densely silky-pilose, pubescence white or coppery brown; inflorescence a dense racemose panicle.
    3. Lower lemmas pubescent between most, sometimes all, of the veins and on the margin, the hairs 3–6 mm long, golden brown ..... *D. insularis*
    3. Lower lemmas glabrous between the veins, pubescent on the margins, sometimes also on the lateral veins, the hairs 1.5–5 mm long, silvery-white to purple ..... *D. californica*
  2. Spikelets glabrous or with a row of hairs between the veins, but never silky-pilose; inflorescence digitate or subdigitate on the culm axis.
    4. Lemma of the bisexual floret light or dark brown to black when mature; blades and sheaths glabrous, pubescent or papillose-pilose.
      5. Spikelets sparsely to densely pubescent with clavate to capitate hairs; rachis triquetrous, not wing-margined; pedicels glabrous or sparsely pubescent ..... *D. filiformis*

5. Spikelets densely pubescent over the veins, hairs not clavate to capitate; rachis shortly winged; pedicels with a ring of stiff hairs just below the spikelets ..... *D. ternata*
4. Lemma of the bisexual floret light gray or straw-colored when mature; blades essentially glabrous and sparsely papillose-hirsute especially near the collar, in contrast with the always papillose-pilose sheaths.
6. Sterile lemmas of the inferior spikelets with 5 equidistant veins; sterile lemmas of the pedicellate spikelets strongly ciliate, the hairs divergent at maturity ..... *D. bicornis*
6. Sterile lemma of the inferior spikelets with notably wider spaces at the intervenes nearer to the midvein than lateral ones; sterile lemmas of the pedicellate spikelets glabrous without any hairs.
7. Marginal veins of the inferior lemma scabrous; inflorescence branches verticillately inserted, branch rachis winged ..... *D. sanguinalis*
7. Marginal veins of the inferior lemma glabrous or nearly glabrous; inflorescence branches racemously inserted, branch rachis not winged ..... *D. ciliaris*

102. *Digitaria bicornis* (Lam.) Roem. & Schult., Syst. Veg. 2: 470. 1817.

FIGURE 79

Plants of indefinite duration; sometimes stoloniferous. Culms with erect portion 10–85 cm tall, long-decumbent, rooting and branching at the lower nodes. Sheaths with papillose-based hairs or the upper sheaths glabrous; ligules 1–4 mm long; blades 3–14 cm long, 2–9 mm wide, mostly glabrous but the adaxial surfaces with papillose-based hairs basally. Panicles with (2)3–6 spikelike primary branches, these digitate or a few solitary branches below; lowest nodes glabrous or with hairs less than 0.4 mm; primary branches 6.5–21 cm long, 0.6–1.3 mm wide, axes winged, wings at least  $\frac{1}{2}$  as wide as the midribs, lower and middle portions with spikelets in unequally pedicellate pairs, pedicels not adnate to the branches; secondary branches absent; shorter pedicels about 0.2 mm; longer pedicels to 2 mm. Spikelets 2.6–3.7 mm long, spikelet pairs dimorphic in their pubescence and venation pattern of the lower lemmas. Lower glumes absent or to 0.9 mm long, deltoid or bifid; upper glumes 1.7–2.8 mm long,  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the spikelets, 3-veined; lower lemmas 7-veined, veins smooth; lower lemmas of shortly pedicellate spikelets with 3 equally spaced, glabrous or shortly pubescent central veins, lemma margins and the region between the 2 lateral veins with appressed or spreading 0.5–1 mm hairs; lower lemmas of long-pedicellate spikelets with unequally spaced veins, midvein well-separated from the 3 lateral veins, lateral veins crowded together near the margins, lemma margins and the region between the 2 inner lateral veins hairy with appressed or strongly divergent hairs 1–2 mm long, sometimes also with longer, glassy yellow hairs; upper lemmas of all spikelets usually yellow or gray, sometimes light brown at maturity; anthers 0.5–0.6 mm long.  $2n = 54, 72$ .

**DISTRIBUTION AND HABITAT.** *Digitaria bicornis* is a common species on the sandy coastal plain of the southeastern United States. Its range extends through Mexico to Costa Rica and northern South America and to the West Indies.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ocampo:** ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 13 km from the Cahuisori–Ocampo road

on the road to Candamena, 2.25 km below Cruz, 23 Sep 1994, 1570 m, *Spellenberg, Corral & Estrada 12147* (NMC).

103. *Digitaria californica* (Benth.) Henrard, Blumea 1(1): 99. 1934. *Panicum californicum* Benth., Bot. Voy. Sulphur 55. 1840.

FIGURE 80

Perennial; caespitose, neither rhizomatous nor stoloniferous. Culms 40–100 cm tall, erect, sometimes geniculate, not rooting, at the lower nodes. Basal sheaths villous; upper sheaths glabrous, densely villous or densely tomentose, or sparsely to densely hairy, with papillose-based hairs; ligules (1)1.5–6 mm long, entire or lacerate, not ciliate; blades 2–12(18) cm long, 2–5(7) mm wide, glabrous or the adaxial surfaces sparsely to densely villous or tomentose. Panicles with 4–10 spikelike primary branches on 5–10 cm rachises, rarely with secondary branches; primary branches 3–6 cm long, appressed to ascending, axes not wing-margined; internodes (mid branch) 2–5.5 mm long, with spikelets in unequally pedicellate pairs; secondary branches rarely present; pedicels not adnate to the branch axes; shorter pedicels 0.1–0.3 mm; longer pedicels 1–2 mm; terminal pedicels of branches 1.7–6(7) mm long. Spikelets homomorphic, (3.7)4–7.5 mm long (including pubescence), 3–5.4 mm long (excluding pubescence), 0.9–1 mm wide; lower glumes 0.4–0.6 mm long; upper glumes 2.5–5.1 mm long (excluding pubescence), narrower than the upper florets, 3-veined, densely villous, hairs 1.5–5 mm long, silvery-white to purple, widely divergent at maturity; lower lemmas 2.7–5 mm long (excluding pubescence), pubescence exceeding the upper florets by 2.2–4 mm, glabrous between the veins, pubescent on the margins, sometimes also on the lateral veins, 7-veined, veins unequally spaced, only the 3 or 5 central veins visible, the hairs 1.5–5 mm long, silvery-white to purple, widely divergent at maturity, intercostal regions glabrous, apex attenuate (acuminate); upper lemmas 2.5–3.4 mm long, ovate-lanceolate, brown to dark brown, acuminate. Caryopsis 1.3–2 mm long.  $2n = 36, 54, 70, 72$ .

**DISTRIBUTION AND HABITAT.** *Digitaria californica* grows on plains and open ground from Arizona, southern Colorado, and Oklahoma through Mexico and Central America to South America.







FIGURE 80. *Digitaria californica*. A. Habit. B. Leaf blades. C. Spikelet showing lower glume and lower lemma. D. Spikelet showing upper glume. Drawn by Linda Ann Vorobik and Hana Pazd'rková; copyright Utah State University.

SPECIMENS EXAMINED. MEXICO. Chihuahua.

**Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, P.M. Peterson & Annable 5754 (US). **Allende:** 20 mi N from Parral to Jiménez on hwy 45, 21 Jul 2006, grassland, 1750 m, K.R. Adams & N. Martínez 061-2006 (CIIDIR). **Ahumada:** Cañón de Santa Clara, 90 km al N de Chihuahua, 19 Oct 1974, 1700 m, Rzedowski 32371 (ENCB); aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6456 (UACJ). **Batopilas:** SW of Chihuahua, Aug 1885, E. Palmer 207 (US). **Buenaventura:** 6 mi E of Buenaventura, 2 Sep 1978, 1768 m, Reeder & C. Reeder 3198 (ENCB, US). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, L. H. Harvey 1390 (US). **Casas Grandes:** El Alamito, Col. Cuauhtémoc, 12 Aug 1999, P. Olivas, R. Rivas, I. Enríquez & A. Márquez POS 837 (UACJ). **Chihuahua:** near Chihuahua, 23 Aug 1885, C.G. Pringle 494 (US); 10 Oct 1935, LeSueur Mex-077 (US); 14 Oct 1910, Hitchcock 7791 (US); 5–10 Jun 1908, E. Palmer 343 (US); La Campana; 1 km Pte. carr. [hwy] Panamericana, 16 Sep 76, pastizal mediano abierto [mostly open grassland], 1500 m, Valdés-Reyna VR-311 (RELC). **Hidalgo del Parral:** 4 mi S of Parral, 1950 m, Soderstrom 835-A (US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 27 Aug 1937, 1460 m, L. H. Harvey 1619 (ENCB, US); Rancho El Carrizo, 30 Sep 1982, 1600 m, pastizal mediano abierto, P. Rojas s.n. (CIIDIR). **Jiménez:** 50 km N of Jiménez, 1 Aug 1939, 1270 m, L.H. Harvey 1374 (US). **Juárez:** km 32 Juárez–Chih., 13 Oct 1997, matorral de gobernadora [governor's scrub], I. Enríquez, S. Ordoñez & J. Leyva IEA6 (UACJ). **Manuel Benavides:** E Chihuahua, Coahuila Boundary, 1 mi E of Pozo de Villa, along rd from Ojinaga to Castillon, via La Mula, Trincheras, 12 Aug 1941, I.M. Johnston 8173 (US). **Mcoqui:** Cerca [near] de Felipe Angeles, 31 Aug 1976, matorral, 1280 m, S. González 386 (RELC).

104. *Digitaria ciliaris* (Retz.) Koeler, Descr. Gram. 27. 1802.  
*Panicum ciliare* Retz., Observ. Bot. 4: 16. 1786.

FIGURE 81

Annual or of indefinite duration. Culms 10–100 cm tall, erect portion 30–60 cm long, long-decumbent, rooting and branching at the decumbent nodes, sparingly branched or unbranched from the upper nodes; nodes 2–5, glabrous. Sheaths with papillose-based hairs; ligules 2–3.5 mm long, erose; blades 1.5–14.4(18.9) cm long, 3–9 mm wide, flat, glabrous, a few scattered papillose-based hairs at the base of the adaxial surfaces (occasionally over the whole adaxial surface), usually also scabrous on both surfaces. Panicles with 2–10 spikelike primary

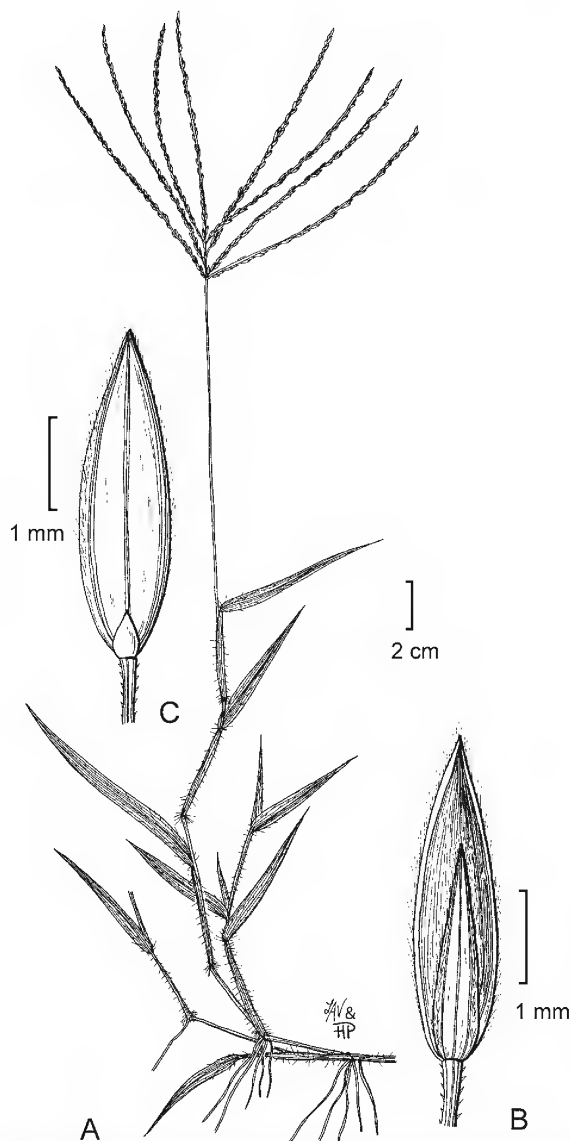


FIGURE 81. *Digitaria ciliaris*. A. Habit. B. Spikelet showing upper glume and upper lemma. C. Spikelet showing lower glume and lower lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

branches, these digitate or in 1–3 whorls on rachises to 2 cm; lowest panicle nodes with hairs more than 0.4 mm; primary branches 3–24 cm long, 0.6–1.2(2) mm wide, glabrous or with less than 1 mm hairs, axes wing-margined, wings at least  $\frac{1}{2}$  as wide as the midribs, lower and middle portions of the branches with spikelets in unequally pedicellate pairs; secondary branches absent; shorter pedicels 0.5–1 mm; longer pedicels 1.5–4 mm.

Spikelets (2.7)2.8–4.1 mm long, homomorphic; lower glumes 0.2–0.8 mm long, acute; upper glumes (1.2)1.5–2.7 mm long, about  $\frac{2}{3}$  to almost as long as the spikelet, 3-veined, margins and apex pilose; lower lemmas 2.7–4.1 mm long, 7-veined, veins unequally spaced, outer 3 veins crowded together near each margin, well-separated from the midvein, usually smooth, occasionally the lateral veins scaberrulous on the distal  $\frac{1}{3}$ , margins and regions between the 2 inner lateral veins hairy, hairs 0.5–1 mm long (rarely glabrous), sometimes also with glassy yellow hairs between the 2 inner lateral veins, these more common on the upper spikelets; upper lemmas 2.5–4 mm long, glabrous, yellow, tan, or gray when immature, becoming brown, often purple-tinged (occasionally completely purple) at maturity; anthers 0.6–1 mm long.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Digitaria ciliaris* is a weedy species, found in open, disturbed areas in most warm-temperate to tropical regions, primarily in the eastern United States and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer 110F* (US); Yamuco, 1 mi E of hwy N of Rio Urique crossing, towards Basihuare and Creel, 6 Sep 2008, slopes with pines and oaks, 1890 m, *P.M. Peterson & J.M. Saarela 22073* (US). **Bocoyna:** Barrancas del Cobre, camino [road] a alto río Urique, por Estación Divisadero, 16 Aug 1976, bosque bajo de leguminosas [low legume forest], 1975 m, *S. González & J.M. Peña 707* (RELC). **Camargo:** Cd. Camargo, 1 Aug 1939, *L. H. Harvey 1381* (US); Rio Conchos, d. Camargo, 5 Aug 1939, 1220 m, *L. H. Harvey 1415* (US). **San Francisco de Conchos:** about 1 mi E of Boquilla Reservoir, 6 Oct 1966, 4200 ft, *Reeder & C. Reeder 4604* (ARIZ, ENCB). **Madera:** Mesa del Yerbánis, ejido El Largo, 12 Oct 1990, bosque de *Quercus*, 1900 m, *O. Bravo 1824* (CIIDIR). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7948* (ENCB, US).

105. *Digitaria cognata* (Schult.) Pilg., Nat. Pflanzenfam. (ed. 2) 14e: 50. 1940. *Panicum cognatum* Schult., Mant. 2: 235. 1824. *Leptoloma cognata* (Schult.) Chase, Proc. Biol. Soc. Washington 19(34): 192. 1906.

Perennial; caespitose, without rhizomes. Culms 30–56 cm tall, erect; nodes glabrous. Leaves mainly cauline; sheaths glabrous or sparsely to densely pubescent, sometimes with papillose-based hairs; ligules 0.2–1.5 mm long, entire to lacerate; blades 2.4–12.6 cm long, 2–5.4 mm wide, glabrous or pubescent. Panicles simple, 12.8–27.5 cm long, 16.5–44.5 cm wide, open; branches divergent; lower primary branches 10.5–24 cm long, often with 1 to several sterile branches near the base; pedicels divergent, spikelets solitary. Spikelets 2.2–3.1 mm long, 0.7–1.1 mm wide, obovate or broadly elliptic; lower glumes 0.1–0.8 mm long; upper glumes 1.8–2.8 mm long, 3(5)-veined, glabrous or pubescent between the veins, hairs appearing as a narrow stripe; lower lemmas similar to the upper glumes in length, texture, and pubescence, 7-veined,

veins unequally spaced, lateral veins closer together than the 3 central veins; upper lemmas 1.9–2.9 mm long, glabrous, dark brown, narrowly acute; anthers 0.5–0.7 mm long, yellow or purple. Caryopsis 1.3–1.6 mm long.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Digitaria cognata* grows in dry, sandy soils in the eastern portion of Canada through the United States and to southern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** near Chihuahua, 23 Aug 1885, C.G. Pringle 489 (US); La Campana Experimental Station and Rancho El Arco Iris, about 81–84 km along the Pan American hwy to Chihuahua City, cattle pastures, June 1977, J.K. Meents & W.H. Moir 146 (ENCB); La Campana; Potrero la Sierra, 1 km W Carr. [hwy] Panamericana, 31 Aug 1973, pastizal mediano abierto [mostly open grassland], 1500 m, Valdés-Reyna VR-51 (RELC). **Juárez:** ca 23 (air) mi S of Cd. Juárez, Sierra Presidio 2.3 mi up road towards Microondas [microwave] Presidio, 11 Sep 1973, 1450 m, J. Henrickson 12795 (NMC); La Campana Experimental Station and Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, J.K. Meents & W.H. Moir 76 (NMC).

**106. *Digitaria filiformis* (L.) Koeler, Descr. Gram. 26. 1802. *Panicum filiforme* L., Sp. Pl. 57. 1753.**

Annual, or short-lived perennial; caespitose, not rhizomatous. Culms (10)25–150 cm tall, erect or decumbent, branching, sometimes rooting at the lower nodes; nodes 3–6. Sheaths keeled, basal sheaths usually with papillose-based hairs, rarely glabrous; ligules 0.3–1.5 mm long; blades 2–18 cm long, 1–6 mm wide, flat or involute, glabrous, scabrous, or pilose. Panicles with 2–7 spike-like primary branches, these digitate or subdigitate, the rachises to 1 cm in length; longest primary branches 3–25 cm long, 0.2–0.4 mm wide, axes triquetrous, not wing-margined, with spikelets in groups of 2–5 on the lower and middle portions; pedicels glabrous or sparsely pilose. Spikelets 1.3–2.8 mm long; lower glumes to 0.1 mm long or absent; upper glumes 1–2 mm long, from  $\frac{3}{4}$  to almost as long as the spikelets, almost glabrous or sparsely to densely pubescent with clavate to capitate hairs (use 20× magnification), glume apex rounded; lower lemmas equaling the spikelets, glabrous or glandular-pubescent, 5- to 7-veined, veins unequally spaced, outer 3 veins on each side closer to each other than the midvein is to the inner lateral veins; upper lemmas 1.3–2 mm long, apiculate, dark brown at maturity; anthers 0.3–0.6 mm long.  $2n = 36$ , 54.

**DISTRIBUTION AND HABITAT.** *Digitaria filiformis* grows throughout the warmer parts of the eastern United States extending into Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 37.4 km S of Creel on road to Batopilas, 10 Sep 1989, pine forest, 2045 m, P.M. Peterson, Annable & Y. Herrera 8012 (ENCB, US); 5.5 mi S of Cieneguita de Barranca on road towards Sorichique, 5 Sep 2003, bosque de pino-encino [pine-oak forest], 2125 m, P.M. Peterson & P. Catalán 17703 (US). **Guerrero:** near Guerrero, 9 Oct 1887, C.G. Pringle 1405 (US).

**107. *Digitaria insularis* (L.) Fedde, Just's Bot. Jahresber. 31(1): 778. 1904. *Andropogon insularis* L., Syst. Nat. (ed. 10) 2: 1304. 1759.**

Perennial; caespitose, short rhizomatous, with knotty bases. Culms 80–130 cm tall, erect, with densely villous cataphylls, branching from the lower and middle nodes. Sheaths usually sparsely to densely papillose-hirsute, occasionally glabrous; ligules 4–6 mm long, usually lacerate, not ciliate; blades 20–50 cm long, 10–17 mm wide, lax, smooth or scaberrulous abaxially, scaberrulous to scabrous adaxially. Panicles 20–35 cm long, 2–10 cm wide, with numerous spike-like primary branches; primary branches 10–15 cm long, appressed to ascending at maturity, axes not wing-margined or with wings less than  $\frac{1}{2}$  as wide as the midribs; internodes 3–4.5(6) mm (mid branch), with spikelets in unequally pedicellate pairs; secondary branches rarely present; pedicels not adnate to the branches; shorter pedicels 0.7–2 mm; longer pedicels 2.5–5 mm; terminal pedicels 2–5 mm. Spikelets 5.5–8.2 mm long (including pubescence), 4.2–5.9 mm long (excluding pubescence), 0.5–0.7 mm wide, narrowly ovate, long apiculate; lower glumes 0.6–0.8 mm long; upper glumes 3.5–4.5 mm long, 3- to 5-veined, pubescent on the margins; lower lemmas 4.1–5.7 mm long (exceeded 1.5–5 mm by pubescence), narrowly ovate, 7-veined, pubescent between most, sometimes all, of the veins and on the margin, the veins usually obscured by a dense covering of golden brown hairs, hairs 3–6 mm long, spreading at maturity, intercostal regions on either side of the midvein glabrous or pubescent with shorter, fine, white hairs, sometimes intermixed with the golden brown hairs; upper lemmas 3.2–4.5 mm long, narrowly ovate, brown when immature, dark brown at maturity, acuminate; anthers 1–1.2 mm long.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Digitaria insularis* grows in low, open ground in the southern United States and extends to the West Indies, Mexico, and through Central America to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, Acacia scrub, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10738 (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 207 (US). **Chihuahua:** near Chihuahua, Aug 1885, C.G. Pringle 378 (US). **Guachochi:** 7.4 km SW of La Bufa and 15 km NE of Batopilas, 920 m, thorn scrub vegetation, 20 Sep 1991, P.M. Peterson, Annable & Valdés-Reyna 10849 (US).

**108. *Digitaria sanguinalis*\* (L.) Scop., Fl. Carniol. (ed. 2) 1: 52. 1771. *Panicum sanguinale* L., Sp. Pl. 1: 57. 1753.**

FIGURE 82

Annual. Culms 20–70(112) tall, often decumbent and rooting at the lower nodes. Sheaths keeled, usually sparsely pubescent with papillose-based hairs; ligules 0.5–2.6 mm; blades 2–11(14) cm long, 3–8(12) mm wide, usually with papillose-based hairs on both surfaces, sometimes glabrous. Panicles with 4–13 spike-like primary branches, these subdigitate or on rachises to 6 cm; primary branches 3–30 cm long, 0.7–1.5 mm wide, flattened

and winged, wings more than  $\frac{1}{2}$  as wide as the midribs, lower and middle portion of the branches with spikelets in unequally pedicellate pairs, pedicels not adnate to the branches; secondary branches rarely present. Spikelets 1.7–3.4 mm long, 0.7–1.1 mm wide, homomorphic; lower glumes 0.2–0.4 mm long, veinless; upper glumes 0.9–2 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the spikelets, 3-veined, pubescent on the margins; lower lemmas usually exceeded or equaled by the upper florets, sometimes exceeding them but by no more than 0.2 mm long, glabrous, 7-veined, lateral (or all) veins scabrous throughout or smooth on the lower  $\frac{1}{3}$  ( $\frac{1}{2}$ ) and scabrous distally, 3 middle veins usually widely spaced, remaining veins on each side close together and near the margins; upper lemmas 1.7–3 mm long, yellow or gray, frequently purple-tinged when immature, often becoming brown at maturity; anthers 0.5–0.9 mm long.  $2n = 36, 28, 34, 54$ .

**DISTRIBUTION AND HABITAT.** *Digitaria sanguinalis* is a weedy Eurasian species that is now found in waste ground in fields, gardens, and lawns throughout much of the world, including Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7695 (US); Barrancas del Cobre camino [road] a Alto Río Urique, 18 Aug 1976, bosque bajo de leguminosas [low legume forest], 1900 m, *S. González & J.M. Peña* 720 (RELC). **Chihuahua:** La Campana, 1 km Pte. carr. [hwy] Panamericana, 18 Sep 73, pastizal [pastureland], 1570 m, *Valdés-Reyna* VR-296 (RELC). La Campana; 4 km Ote. [W] carr. Panamericana, 6 Sep 73, lotes producción de semilla [seed-production lots], 1500 m, *Valdés-Reyna* VR-102 (RELC). **Cusihuiriachi:** Laguna Grande, 10 Aug 1975, vegetación riparia [riparian vegetation], 1950 m, *J.M. Peña* JMP-133 (RELC). **Guachochi:** Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, *P.M. Peterson & P. Catalán* 17587 (CIIDIR, US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1937, 1450 m, *L. H. Harvey* 1595 (US). **Madera:** Chuichupa, 31 Aug 1936, *LeSueur* 0186 (US); Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino, 1200 m, *A. Benítez* 2898 (CIIDIR); La Tinaja, ejido El Largo, 29 Aug 1990, bosque de encino–pino [oak–pine forest], 1840 m, *O. Bravo* 1335 (CIIDIR); Arroyo de la Quinta, ejido “El Largo”, 30 Aug 1990, bosque de pino, 2340 m, *A. Benítez* 2103 (CIIDIR). **Matamoros:** 9 mi S of Villa Matamoros, 7 Sep 1967, *Reeder & C. Reeder* 4881 (ARIZ, US). **Moris:** Mesa del Agua, 4.8 km S of Campanero (on Mesa de Campanero), 29 Sep 2003, 1990 m, *T.R. Van Devender, A.L. Reina, M.A. Dimmitt & M.W. Eubanks* 2003-1096 (NMC). **Ocampo:** Parque Nacional

**FIGURE 82.** *Digitaria sanguinalis*. A. Habit. B. Spikelet showing lower glume and lower lemma. C. Spikelet showing upper glume and upper lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



“Cascada de Basaseachic,” along the road as it enters camp area at trail head to top of falls, 1 Aug 1988, 2000 m, *Spellenberg, R. Corral, J. Brunt & L. Huenneke* 9649 (NMC). **Riva Palacio:** Majalca (Pilares), 12 Aug 1939, *L. H. Harvey* 1484 (US).

**109. *Digitaria ternata*** (Hochst. ex A. Rich.) Stapf, Fl. Cap. 7: 376–377. 1898.

Annual; geniculate at the base. Culms very variable in size, up to (20)50–125 cm tall. Sheaths glabrous with hyaline margins; ligule membranous truncate; blades 5–20(50) cm long, 4–6 mm wide, flat, apiculate, glabrous, with some cilia adaxially. Panicles 4–10(15) cm long, with 2–10 racemes erect, the rachis shortly winged, pedicels with a ring of stiff hairs just below the spikelets; spikelets 2–2.5 mm long, oblong-elliptic, in pairs and those from the central part, the racemes in triads, 1 sessile and 2 pedicelate, tomentose; lower glumes missing, upper glumes 0.9–1.8 mm long, elliptic-lanceolate, 3-veined, pubescent between veins. Lemmas of the sterile floret 1.8–2.5 mm long, 5-veined, densely pubescent especially in the lateral veins; paleas reduced to a scale; lemma of the fertile floret 1.8–2.5 mm long, elliptic, dark brown.

**DISTRIBUTION AND HABITAT.** *Digitaria ternata* grows in open land, grasslands, and road edges; it is known from Mexico to South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Moris:** Mesa del Agua, 4.8 km S of Campanero (on Mesa de

Campanero), 29 Sep 2003, 1990 m, *T.R. Van Devender, A.L. Reina, M.A. Dimmitt & M.W. Eubanks* 2003–1098 (NMC).

### ***Dinebra* Jaq.**

Plants annual. Culms 13–120 cm tall, not woody. Ligules membranous, truncate, lacerate, sometimes ciliate; blades linear, flat. Inflorescence terminal, panicles of 1–70, 1-sided, spikelike branches, irregularly disposed on elongate rachises, clearly exceeding the upper leaves; branches with 2 rows of 1 or more closely imbricate, sessile spikelets, proximal spikelets sometimes replaced by short, tardily deciduous, secondary branches; disarticulation at the base of the branches or at the base of the secondary branches and (eventually) beneath the florets. Spikelets laterally compressed, cuneate, with 1–3 florets. Glumes subequal, much longer than the florets, usually exceeding the distal florets, coriaceous or membranous, strongly keeled, acuminate-aristate; lemmas thinly membranous, weakly keeled, 3-veined, pilose over the veins, apex acute to 2-lobed, central veins excurrent, forming mucros. Caryopses elliptic-oblong, trigonous.  $x = 10$ .

*Dinebra*, a genus of 23 species, is native from Africa to Madagascar and India and in the Americas (Peterson et al., 2012, 2015, 2016). Four species have been reported from Chihuahua.

### **KEY TO SPECIES OF *DINEBRA***

1. Sheaths sparsely to densely hairy, the hairs papillose-based ..... *D. panicea*
1. Sheaths lacking hairs or with hairs that are not papillose-based.
  2. Panicles with 25–150 branches.
    3. Lemmas 2.4–3 mm long; anthers 0.6–0.8 mm long; spikelets 4–5 mm long ..... *D. panicoides*
    3. Lemmas 1.2–2.4 mm long; anthers 0.2–0.6 mm long; spikelets 2.5–4.5 mm long ..... *D. scabra*
  2. Panicles with 2–25 branches.
    4. Panicles 2–17 cm long, with 5–23 branches; anthers 0.4–0.5 mm long; caryopses 0.4–0.5 mm wide ..... *D. viscida*
    4. Panicles 20–35 cm long, with 20–90 branches; anthers 0.6–0.8 mm long; caryopses about 0.7 mm wide ..... *D. panicoides*

**110. *Dinebra panicea*** (Retz.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Poa panicea* Retz., Observ. Bot. 3: 11. 1783. *Leptochloa panicea* (Retz.) Ohwi, (Retz.) Ohwi, Bot. Mag. (Tokyo) 55(655): 311. 1941.

Annual. Culms (5)13–150 cm tall, usually erect, compressed, branching; internodes hollow. Sheaths sparsely or densely hairy, particularly distally, hairs papillose-based; ligules 0.6–3.2 mm long, membranous, truncate, erose; blades 6–25 cm long, 2–21 mm wide, glabrous or sparsely pilose on both surfaces. Panicles 8–30 cm long, with 3–100 racemose branches; branches 1–19 cm long, ascending to reflexed. Spikelets 2–4 mm

long, distant to imbricate, green, magenta, or maroon, with 2–5(6) florets; glumes sometimes exceeding the florets, linear to narrowly elliptic, acute, attenuate, or aristate; lower glumes 1.6–4 mm long, linear to lanceolate; upper glumes 1.6–3.6 mm long, lanceolate; lemmas 0.9–1.7 mm long, glabrous or somewhat sericeous, acute to obtuse; paleas glabrous or sericeous; anthers 3, 0.2–0.3 mm long. Caryopsis 0.8–1.2 mm long, 0.5–0.6 mm wide, nearly round in cross section, with or without a ventral groove, apex acute to broadly obtuse.

**DISTRIBUTION AND HABITAT.** *Dinebra panicea* is a cosmopolitan species, Two varieties are present in Chihuahua.

### **KEY TO VARIETIES OF *DINEBRA PANICEA***

1. Glumes linear to narrowly lanceolate, exceeding the florets; lemmas 0.9–1.2 mm long; caryopsis without a ventral groove, often somewhat coarsely rugose, the apex broadly obtuse ..... *D. panicea* subsp. *mucronata*



1. Glumes lanceolate to narrowly elliptic, not or only slightly exceeding the florets; lemmas 1.3–1.7 mm long; caryopsis usually with a narrow, shallow ventral groove, smooth, the apex broadly obtuse to acute . . . . . *D. panicea* subsp. *brachiata*

*D. panicea* subsp. *brachiata* (Steud.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012.

FIGURE 83

**DISTRIBUTION AND HABITAT.** United States, Mexico, Central America, South America, and Caribbean Islands.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer 117* (US); “La cueva larga” [long cave] a 4 km al NE de Batopilas, 16 Sep 1983, selva baja caducifolia [low deciduous forest], 650 m, *Tenorio & R. Torres 4439* (MEXU); 12.3 km N of Batopilas near the Río Batopilas, 12 Sep 1989, oak forest, 800 m, *P.M. Peterson, Annable & Y. Herrera 8058* (ENCB, US); Batopilas, 25 Sep 1981, selva baja caducifolia, 530 m, *M.E. Siqueiros 1659* (MEXU). **Bocoyna:** entre [between] Barrancas del Cobre & Bacahipare, bosque bajo de leguminosas [low legume forest], 17 Aug 1976, 1000 m, *S. González & J.M. Peña 731* (ENCB). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, 1460 m, *L. H. Harvey 1507* (US). **Juarez:** Paso del Norte, 28 Aug 1886, *C.G. Pringle 1161* (US). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 18 km from the Cahuisori–Ocampo road on the road to Candamena, 7.5 km below Cruz, 24 Sep 1994, 1260 m, *Spellenberg, Corral & Estrada 12183* (NMC). **Saucillo:** along Isla de Perla road about 4 mi E of Cd. Delicias, in cultivated and irrigated valley, 11 Jul 1950, *Reeder, C. Reeder & Goodding 1259* (ENCB).

*D. panicea* subsp. *mucronata* (Michx.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012.

**DISTRIBUTION AND HABITAT.** United States, Mexico, Central America, South America, and Caribbean Islands.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Bajada de Batopilas, 25 Sep 1981, selva baja [low jungle], 780 m, *R. Fierros 1656* (MEXU); Batopilas, 25 Sep 1981, selva baja, 530 m, *M.E. Siqueiros 1659* (MEXU); along Arroyo Samachique, on N side of Barranca de Batopilas, west of La Bufa, 5 Aug 1973, tree forest, clump grass, 3000 ft, *Bye 4563* (MEXU). **Camargo:** Km 2 carr. [hwy] Camargo–Chih. 29 Sep 1995, orilla del camino [wayside], 1240 m, *González 93* (MEXU). **Chihuahua:** SW Chihuahua, Aug–Nov. 1885, *E. Palmer 117* (MEXU).

**111. *Dinebra panicoides*** (J. Presl) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Megastachya panicoides* J. Presl, Reliq. Haenk. 1(4–5): 283. 1830. *Leptochloa panicoides* (J. Presl) Hitchc.

Annual. Culms (7)45–110 cm tall, often geniculate below, usually ascending to erect above, rarely branching at the base, often branching distally; internodes hollow. Sheaths glabrous, margins occasionally sparsely ciliate on the basal ½; ligules

2.2–3.8 mm long, membranous, truncate, somewhat erose; blades 4–20 cm long, 4–8 mm wide, both surfaces smooth or scaberrulous. Panicles 20–35 cm long, with 20–30(90) racemose branches; branches 2.5–7 cm long, ascending, mostly stiff. Spikelets 4–5 mm long, usually somewhat imbricate, with 4–6(7) florets; lower glumes 0.9–1.9 mm long, usually lanceolate, sometimes falcate, acute; upper glumes 1.8–2.3 mm long, ovate, acute to obtuse; lemmas 2.4–3 mm long, narrowly elliptic to ovate, membranous, midveins and lateral veins sericeous basally, lateral veins prominent, excurrent, apex acute to broadly acute, unawned, sometimes mucronate; paleas glabrous; anthers 3, 0.6–0.8 mm long. Caryopsis 1.1–1.4 mm long, 0.7 mm wide, elliptic, depressed obovate in cross section.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Dinebra panicoides* is native from the central Mississippi and Ohio River drainages south through Mesoamerica to Brazil.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, *P.M. Peterson & P. Catalán 17588* (CIIDIR, US).

**112. *Dinebra scabra*** (Nees) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Leptochloa scabra* Nees, Agrostogr. Bras. 2: 435. 1829.

Annual. Culms (12)20–125 cm tall, mostly erect, often strongly compressed, branching; internodes hollow. Sheaths glabrous, smooth to scabrous; ligules 1.5–2 mm long, membranous, truncate, erose; blades 25–35(50) cm long, 8–16 mm wide, scabrous on both surfaces. Panicles 8–35 cm long, with 50–150 racemose branches; branches (2)5–12 cm long, lax, sometimes arcuate, lower branches often remaining enclosed in the upper leaf sheaths. Spikelets 3–4.5 mm long, usually tightly imbricate, green but straw-colored when dry, with 2–6 florets; glumes sometimes mucronate; lower glumes 0.8–1.6 mm long, narrowly triangular to lanceolate; upper glumes 1.1–2.1 mm long, ovate; rachilla internodes not visible between the florets; lemmas 2.1–2.4 mm long, lanceolate to narrowly ovate, membranous, sparsely sericeous along the lateral veins, apex acute, unawned; anthers 0.2–0.4 mm long. Caryopsis 0.8–1.3 mm long, 0.3–0.5 mm wide, elliptic to obovate, depressed obovate in cross section.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Dinebra scabra* is a neotropical species that extends into South America and is uncommon in Mexico and the United States. It is often confused with *D. panicoides*, but it has more flexuous to arcuate panicle branches, shorter spikelets, and less prominent lemma veins. It may also be confused with *Diplachne fusca* subsp. *uninervia*, from which it differs in its acute lemmas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

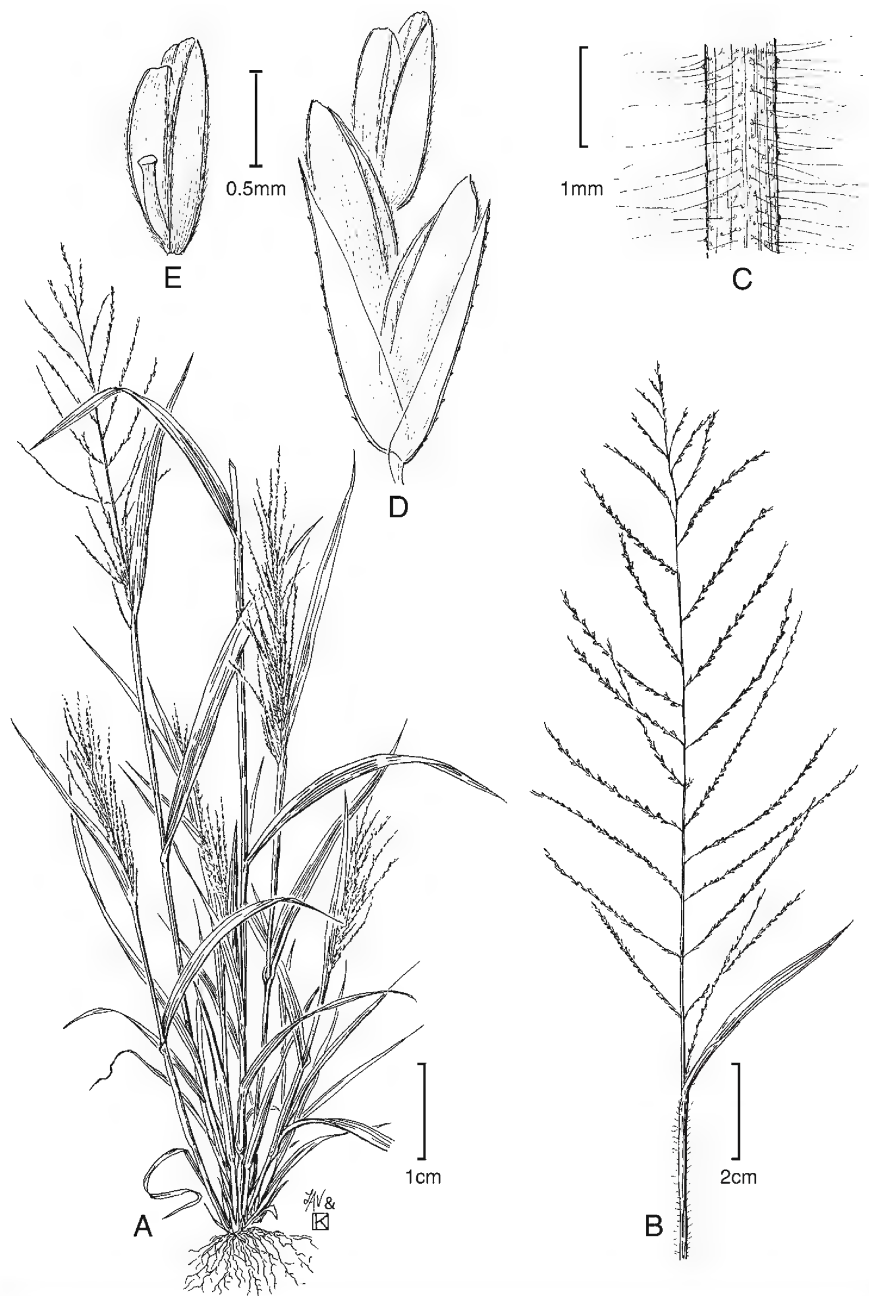


FIGURE 83. *Dinebra panicea* subsp. *brachiata*. A. Habit. B. Inflorescence C. Sheath showing papillose-based hairs. D. Spikelet. E. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

113. *Dinebra viscida* (Scribn.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Diplachne viscida* Scribn., Bull. Torrey Bot. Club 10(1): 30. 1883. *Leptochloa viscida* (Scribn.) Beal, Grass. N. Amer. 2: 434. 1896.

Annual. Culms (3)10–60 cm tall, prostrate or erect, round or somewhat compressed, often highly branched; internodes hollow. Sheaths glabrous (rarely sparsely pilose near the base), sometimes with a sticky exudate; ligules 1.2–2.5 mm long, truncate, erose to lacerate; blades 1–15 cm long, 1.2–5.5 mm wide, glabrous abaxially and adaxially. Panicles 2–17 cm long, with 5–23 racemose branches; branches 1–2.5(3.5) cm long, stiff, often included in the upper leaf sheaths. Spikelets 4.5–7.5 mm long, more or less imbricate, magenta or green, with 2–6 florets; glumes triangular, acute; lower glumes 1.6–2 mm long, acute; upper glumes 2–2.9 mm; lemmas 2.4–3.5 mm long, ovate, membranous, sericeous along the lower veins, lateral veins pronounced, apex acute, obtuse, or truncate, awned, the awns 0.5–1.5 mm long; paleas minutely scabrous along the veins; anthers 3, 0.4–0.5 mm long. Caryopsis 1.2–1.6 mm long, 0.4–0.5 mm wide, narrowly elliptic to obovate, transversely elliptic in cross section.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Dinebra viscida* is a Sonoran Desert species that occurs from southern California to southwestern New Mexico and south into adjacent Mexico. It differs from *Diplachne fusca* subsp. *fascicularis*, which grows in the same region, in its consistently short-awned lemmas, smaller panicles, often prostrate and much-branched growth habit, and often reddish florets.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Ahumada: 3 mi W of El Sueco, 16 Sep 1960, Reeder, C. Reeder & Soderstrom 3494 (ARIZ, US). Chihuahua: near Chihuahua, 17 Sep 1885, C.G. Pringle 814 (US); Chihuahua, 14 Oct 1910, Hitchcock 7781 (US). Hidalgo del Parral: 8 mi S of Parral, 2 Oct 1959, Soderstrom 851 (US). Matamoros: 9 mi S of Villa Matamoros, in water of a depression, 7 Sep 1967, 5600 ft, Reeder & C. Reeder 4882 (ARIZ, ENCB, US). Moris: Rancho El Berrendo, junto al preson del [next to] Moris, 17 Oct 1980, pastizal [pastureland], I.D. Enriquez 752 (MEXU).

### *Diplachne* Haller

Annual. Culms 15–120 cm tall, erect or geniculately ascending. Ligule an eciliate or ciliolate membrane. Inflorescence composed of racemes along a central axis, spreading or deflexed, linear, oblong or cuneate, unilateral, bearing 2–20

fertile spikelets on each; rachis persistent or deciduous from axis, wingless or narrowly winged, flattened or angular. Spikelet appressed, solitary; fertile spikelets sessile, lanceolate or cuneate, laterally compressed, comprising 1–4 fertile florets, with diminished florets at the apex, disarticulating below each fertile floret when mature; rachilla internodes definite. Glumes 1.5–3 length of adjacent fertile lemma, subequal, exceeding apex of florets, persistent, firmer than fertile lemma, lanceolate or elliptic, 1-keeled, (1)2- to 3-veined, apex acute, attenuate or caudate, membranous or coriaceous; fertile lemma ovate, membranous, keeled, wingless, 3-veined, midvein pubescent, surface unwrinkled, without grooves, margins pubescent, apex entire or dentate, bifid, emarginate, obtuse or acute, muticous or mucronate; palea 0.8–0.9 length of lemma, 2-veined, keels eciliate or pubescent. Cryopsis with adherent pericarp, ellipsoid, isodiametric, trigonous.

*Diplachne* is a genus with two species from Africa, Asia, or Australasia (Peterson et al., 2012, 2015, 2016; Snow et al., in press). A single species occurs in Chihuahua.

114. *Diplachne fusca* (L.) P. Beauv. ex Roem. & Schult., Syst. Veg. 2: 615. 1817. *Leptochloa fusca* (L.) Kunth, Révis. Gramin. 1: 91. 1829.

FIGURE 84

Annual or weak perennials. Culms 5–170 cm tall, prostrate to erect; compressed, often branching; internodes hollow. Sheaths glabrous or scabrous; ligules 2–8 mm long, membranous, attenuate, becoming lacerate at maturity; blades 3–50 cm long, 2–7 mm wide, glabrous or scabrous, those of the flag leaves sometimes exceeding the panicles. Panicles (1.5)10–105 cm long, 0.5–22 cm wide, with 3–35 racemose branches, bases of the panicles sometimes remaining enclosed in the upper leaf sheaths at maturity; branches 1.5–20(22) cm long, ascending to reflexed. Spikelets 5–12(14) mm long, with 6–20 florets; lower glumes 1–3(4.9) mm long; upper glumes 1.8–5.5 mm long; lemmas 2–6 mm long, sometimes with a dark spot near the base, apex acute to truncate, sometimes emarginate to bifid, unawned, mucronate, or awned; paleas somewhat sericeous along the veins; anthers 0.2–2.7 mm long, 1–3. Caryopsis 0.8–2.4 mm long, elliptic to ovate or obovate.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Diplachne fusca* grows in warm areas throughout the world. There are two subspecies in the region, subsp. *uninervia* and subsp. *fascicularis*.

### KEY TO SUBSPECIES OF *DIPLACHNE FUSCA*

1. Uppermost leaf blades exceeding the panicles; panicles usually partially enclosed in the uppermost leaf sheaths; mature lemmas often whitish with a dark spot in the basal ½ . . . . . *D. fusca* subsp. *fascicularis*
1. Uppermost leaf blades exceeded by the panicles; panicles usually completely exserted; mature lemmas usually greenish or plumbeous, lacking a dark spot . . . . . *D. fusca* subsp. *uninervia*

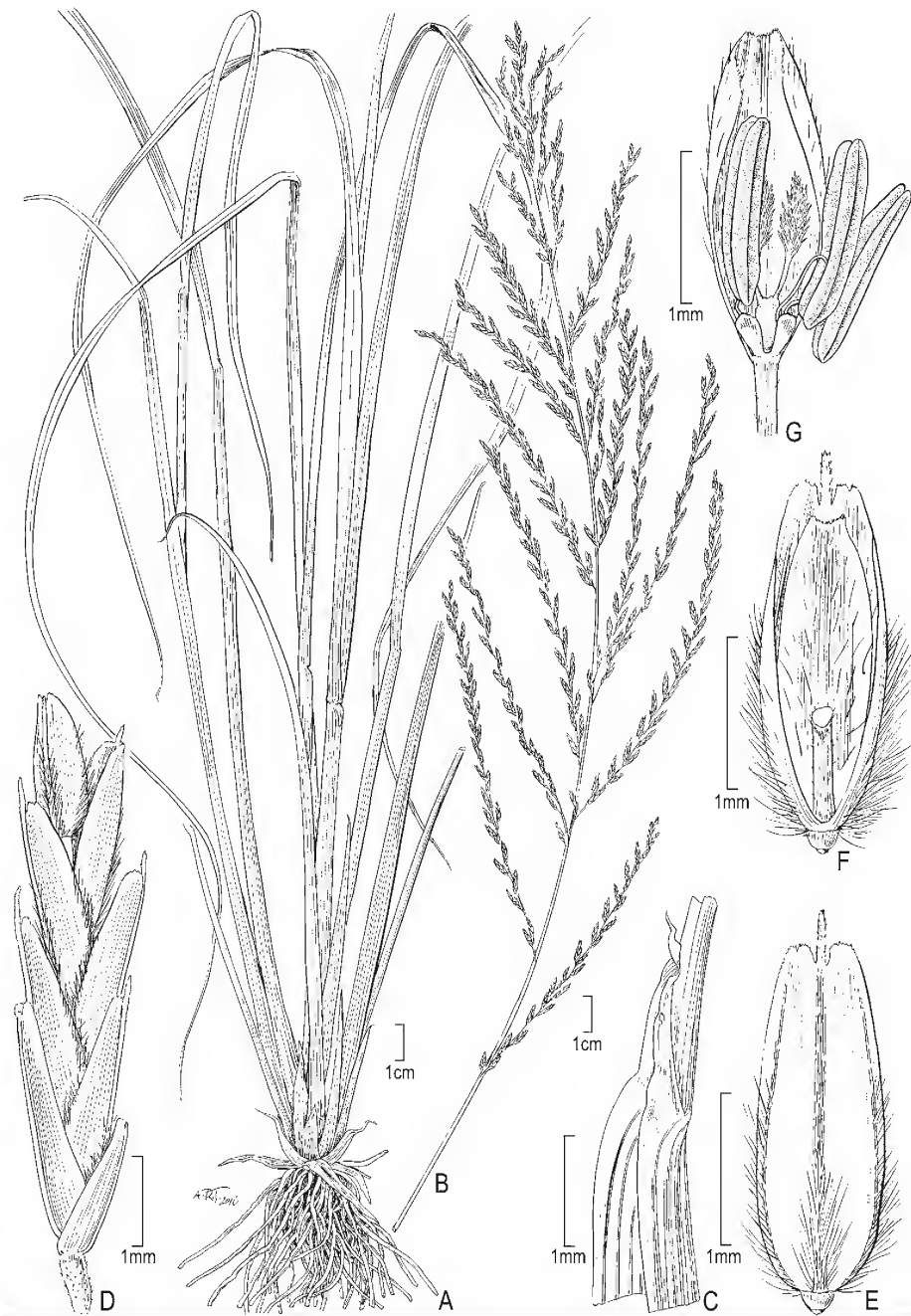


FIGURE 84. *Diplachne fusca* subsp. *fusca*. A. Habit. B. Inflorescence. C. Ligule. D. Spikelet. E. Lemma. F. Floret. G. Palea with lodicules, stamens, and ovary. Drawn by Alice R. Tangerini for Smithsonian Institution, Department of Botany.



*Diplachne fusca* subsp. *fascicularis* (Lam.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Festuca fascicularis* L., Amer. Tabl. Encycl. 1: 189. 1791.

**DISTRIBUTION AND HABITAT.** *Diplachne fusca* ssp. *fascicularis* is the most common subspecies from aquatic environments; it grows in cultivated and irrigated places; distributed throughout America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Ahumada: aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6464 (UACJ). Camargo: Río Conchos, Cd. Camargo, 5 Aug 1939, 1220 m, L. H. Harvey 1403 (US). Chihuahua: near Chihuahua, 17 Sep 1885, C.G. Pringle 813 (US). Cuauhtémoc: 11 mi W of Cuauhtémoc, 4 Sep 1967, 7000 ft, Reeder & C. Reeder 4844 (ARIZ, ENCB, US). Gómez Farías: Laguna de Babicora, 18 Aug 1994, 2150 m, T. Lebgue & E. Estrada 3298 (NMC). Jiménez: bank of the Río Florido, 28 Jul 1939, 1340 m, L. H. Harvey 1320 (ENCB, US); At Papalote Las Juntas, (Preson de Antojos) 2 km NW de Hacienda El Berrendo, on Las Pampas ranch, 25 Aug 1972, mezquitil, 1450 m, F. Chiang, T. Wendt & M.C. Johnston 8870 (MEXU). Madera: Río Aros, 23 Aug 1937, LeSueur 0202 (US). Matamoros: 9 mi S of Villa Matamoros, 7 Sep 1967, Reeder & C. Reeder 4883 (ARIZ, US). Nuevo Casas Grandes: km 33 Nuevo Casas Grandes–Buenaventura 23 Oct 1954, Hern.-Xol. & C. Tapia N-130 (US).

*Diplachne fusca* subsp. *uninervia* (J. Presl) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Megastachya uninervia* J. Presl, Reliq. Haenk. 1(4–5): 283. 1830.

**DISTRIBUTION AND HABITAT.** This subspecies is native from the southern United States to Argentina and has been found in Chihuahua growing in an irrigation canal.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua: Cerca del Río, 15 May 1885, C.G. Pringle 438 (MEXU). Juárez: Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadow and irrigation canals], 1120 m, R. Corral RCD6279 (UACJ).

### *Disakisperma* Steud.

Annual or perennial; caespitose. Culms usually ascending to erect, often geniculate at the lower nodes, occasionally prostrate and rooting at the lower nodes, often branching at the aerial nodes; nodes usually glabrous; internodes usually hollow. Leaves usually primarily cauline, occasionally in basal rosettes; sheaths open; ligules obtuse to attenuate, usually membranous, sometimes ciliate; blades flat, involute when dry, usually ascending to erect, apex attenuate. Primary inflorescences terminal, panicles of 2–150 nondisarticulating, spike-like branches, usually exceeding the leaves; branches digitate, subdigitate, or racemose on the rachises, 1-sided, usually spikelet-bearing throughout their length, spikelets in 2 rows, axes terminating in a functional spikelet, lower branches occasionally with secondary branching; secondary panicles sometimes present, axillary to and concealed by the

lower sheaths, their florets not disarticulating; disarticulation in the primary panicles beneath the florets. Spikelets rounded to slightly keeled on the back, distant to tightly imbricate, not conspicuously pubescent, with (2)3–12(20) bisexual florets; rachillas rarely prolonged. Glumes usually unequal, sometimes subequal, exceeded by the florets, membranous, rounded to weakly keeled, 1-veined, veins scabrous, apex unawned (rarely mucronate); florets usually bisexual; calluses distinct or poorly developed, glabrous or pubescent; lemmas membranous, usually pubescent at least over the lower portion of the veins, 3(5)-veined, apex entire or minutely bilobed, unawned, mucronate, or awned; paleas usually subequal to the lemmas, membranous or hyaline. Caryopsis obovate to elliptic, falling free of the lemmas and paleas.  $x = 10$ .

*Disakisperma* was recently segregated from *Leptochloa* and is a genus of four species, with only one in Chihuahua (Peterson et al., 2012; Snow et al., 2013).

115. *Disakisperma dubium* (Kunth) P. M. Peterson & N. Snow, Ann. Bot. 109: 1317–1329. 2012. *Chloris dubia* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 169. 1815. *Leptochloa dubia* (Kunth) Nees, Syll. Pl. Nov. 1: 4. 1824.

FIGURE 85

Perennial. Culms (10)30–110 cm tall, round or basally compressed, tillering from the basal nodes, not branching from the aerial nodes, mostly glabrous, sometimes pilose basally; internodes solid. Sheaths sometimes with a pilose collar; ligules 1–2 mm long, truncate, erose; blades (2)8–35 cm long, 2–8 mm wide, glabrous, strigose, or pilose. Panicles 8–20 cm long, with 2–15 subdigitate or racemose branches; secondary panicles often hidden in the lowest leaf sheaths; branches 2–19 cm long, ascending to spreading at maturity. Spikelets 4–12 mm long, light brown to dark olive-green, with 4–13 florets, often widely divergent at anthesis; glumes narrowly triangular to ovate, acute; lower glumes 2.3–4.8 mm long; upper glumes 3.3–6 mm long; lemmas 3.5–5 mm long, membranous, ovate to obovate, lateral veins glabrous or sericeous, hairs often restricted to the basal portion, sometimes also sericeous on the midvein and between the veins, apex obtuse to truncate, usually emarginate, unawned, sometimes mucronate; paleas ciliate on the margins; anthers 3, 0.3–1.6 mm long. Caryopsis 1.5–2.3 mm long, 0.9–1 mm wide, strongly dorsally compressed.  $2n = 40, 60, 80$ .

**DISTRIBUTION AND HABITAT.** *Disakisperma dubia* ranges from the southwestern United States and Florida throughout Mexico to Argentina, often in well-drained, sandy or rocky soils. It provides fair to good forage but is seldom abundant.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Ahumada: Cañón de Santa Clara, 90 km al N de Chihuahua, pastizal con encinos [pastureland with oak], 19 Oct 1974, 1700 m, Rzedowski 32376 (ENCB); Rancho el Peñasco km 150, carr [hwy] Chih–Cd. Juárez, 9 Aug 1979, pastizal, Siqueiros 334 (MEXU). Aldama: 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988,



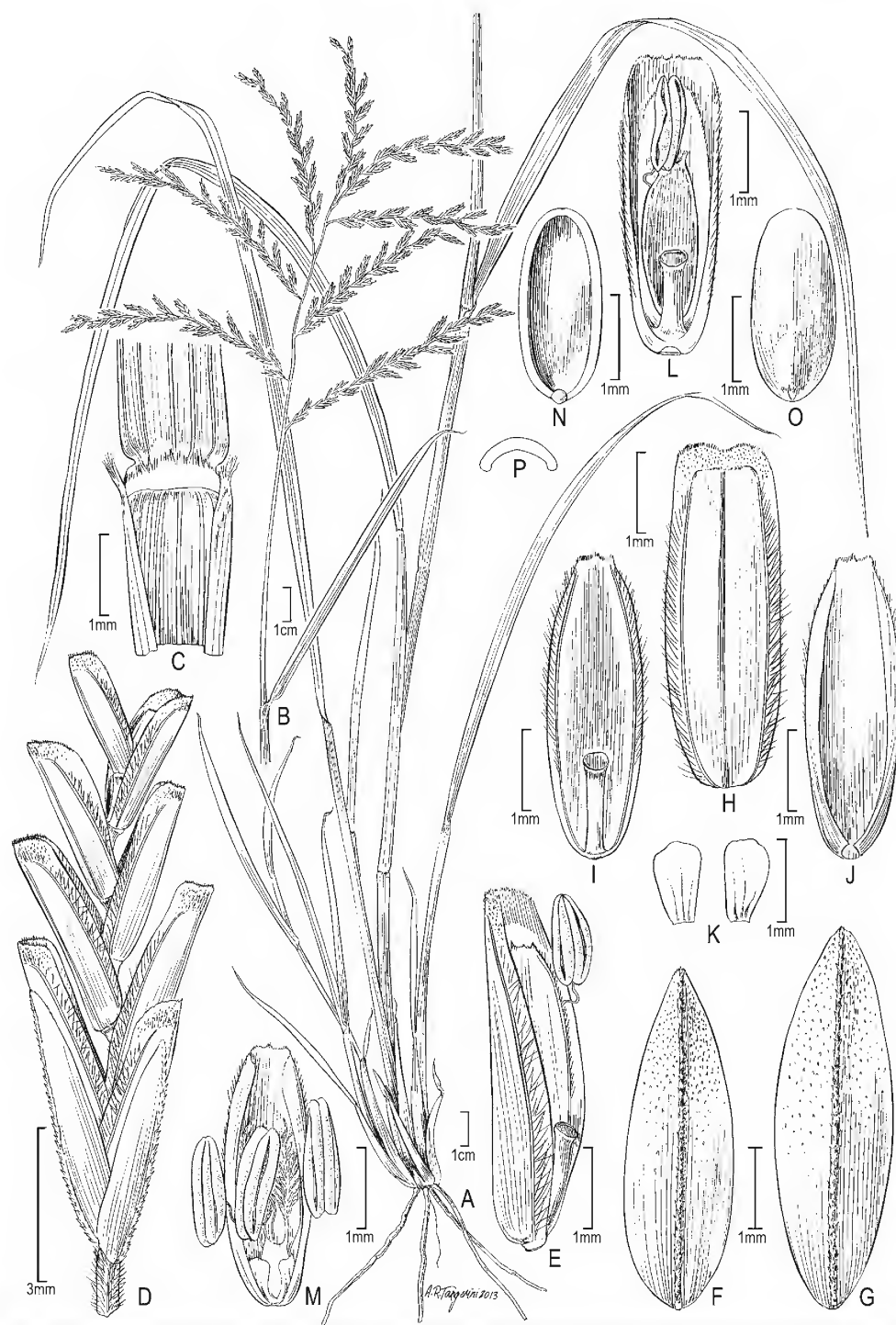


FIGURE 85. *Disakisperma dubium*. A. Habit. B. Inflorescence. C. Ligule. D. Spikelet. E. Floret. F. Lower glume. G. Upper glume. H. Lemma. I. Palea, ventral view. J. Palea, dorsal view. K. Lodicules. L. Floret, ventral view. M. Palea with lodicules, pistil, and stamens. N. Caryopsis, ventral view. O. Caryopsis, dorsal view. P. Caryopsis, cross section. Drawn by Alice R. Tangerini for Smithsonian Institution, Department of Botany.

1400 m, *P.M. Peterson & Annable 5761* (ENCB, US); km 53 Chihuahua–Ojinaga, 24 Aug 1978, matorral [scrub], 1325 m, *M. Gutiérrez, B. Rodríguez 29* (MEXU). **Allende:** carr. 45 Parral–Torreón, 20 km al N del poblado Río Florido, zacatal & manchones de juniperus [grassland and spots of juniper], 15 Sep 1970, 1850 m, *L.M. Villarreal de Puga 4106* (ENCB). **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, *P.M. Peterson, Annable & Valdés-Reyna 10727* (CIIDIR); carr. Parral–Balleza, 27 Sep 1981, bosque de encino [oak forest], 2100 m, *M.E. Siqueiros 1570* (MEXU); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson 20026, F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Camargo:** km 2 carr. Camargo–Chih., 29 Sep 1995, orilla de camino [wayside], 1240 m, *Ing. González 92* (MEXU); 10 mi N of Ciudad Camargo, 4 Oct 1953, 1280 m, cultivated area, 1280 m, *Reeder & C. Reeder 2612* (MEXU). **Casas Grandes:** Rancho Palanganas (Mesa el Cuervo), 12 sept 1996, pastizal, 2200 m, *Fierros 124* (MEXU). **Chihuahua:** W of Chihuahua, 10 Oct 1935, *LeSueur Mex-079* (US); 6.1 mi W of Hwy 45 on dirt road towards Santa Clara, 18 Oct 1992, bosque de encino, 1640 m, *P.M. Peterson & Annable 12581* (US); hills & plains near Chihuahua, Aug 1885, *C.G. Pringle 537* (US), 422 (US) Isotype; Valley near Chihuahua, 27 Sep 1886, *C.G. Pringle 1027* (MEXU); Chihuahua, 14 Oct 1910, *Hitchcock 7776* (US). **Gran Morelos:** km 21 carr. Chihuahua–Namiquipa (via corta [short]), 25 Nov 1997, bosque de encino, 1830 m, *M.A. Vergara 193* (MEXU). **Hidalgo del Parral:** 10 km al S de Parral, ruderal, 29 Sep 1983, 1800 m, Blanco-Aguirre 2108 (ENCB). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 27 Aug 1939, 1460 m, *L. H. Harvey 1620* (ENCB, US). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, *P.M. Peterson & R.M. King 8160* (US). **Jiménez:** 8 mi N of Jiménez on Mex. 45, 30 Aug 1971, 4400 ft, *L. H. Harvey 8893* (ENCB). **Práxedes G. Guerrero:** aprox. 3 km al NW del Porvenir, por la carr. Juárez–Porvenir, a los lados de

cultivo de algodón [near cultivated cotton], 8 Sep 1994, 1090 m, *R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5404* (UACJ). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of hwy 45, N of Chihuahua, 22 Sep 1988, grassland, 1700 m, *P.M. Peterson & Annable 5769* (ENCB, US). **Saucillo:** Mancomún El Pajarito Domingero 18 km de las Varas, 10 Oct 1995, matorral, 1280 m, *Fierros 99* (MEXU). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, *P.M. Peterson & Annable 8095* (ENCB, US); 87.7 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1620 m, *P.M. Peterson & Annable 8105* (ENCB, US). *P.M. Peterson, Annable & Valdés-Reyna 10727* (US).

### *Distichlis* Raf.

Perennial; usually unisexual, occasionally bisexual; strongly rhizomatous and/or stoloniferous. Culms usually erect, glabrous. Leaves conspicuously distichous; lower leaves reduced to scale-like sheaths; upper sheaths strongly overlapping; ligules shorter than 1 mm long, membranous, serrate; upper blades stiff, glabrous, ascending to spreading, usually equaling or exceeding the pistillate panicles. Inflorescences terminal, contracted panicles or racemes, sometimes exceeding the upper leaves. Spikelets laterally compressed, with 2–20 florets; disarticulation of the pistillate spikelets above the glumes and below the florets, staminate spikelets not disarticulating. Glumes 3- to 7-veined; lemmas coriaceous, staminate lemmas thinner than the pistillate lemmas, 9- to 11-veined, unawned; paleas 2-keeled, keels narrowly to broadly winged, serrate to toothed, sometimes with excurrent veins; anthers 3. Caryopsis glabrous, free from the palea at maturity, brown.  $x = 10$ .

*Distichlis*, a genus of 11 species, grows in saline soils of the coasts and interior deserts of the Western Hemisphere and Australia (Peterson et al., 2016). All the species grow in South America, four grow in North America with two in Chihuahua.

### KEY TO SPECIES OF *DISTICHLIS*

1. Inflorescences with multiple spikelets; leaf blades 1–8(20) cm long, stiff or lax . . . . . *D. spicata*  
 1. Inflorescences composed of a single spikelet; leaf blades 0.5–1.5 cm long, stiff . . . . . *D. littoralis*

**116. *Distichlis littoralis*** (Engelm.) H. L. Bell & Columbus, Syst. Bot. 33(3): 536–551. 2008. *Monanthochloë littoralis* Engelm., Trans. Acad. Sci. St. Louis 1: 437, pl. 13–14. 1859.

Plants with long, wiry stolons. Culms 8–15 cm tall, clustered, erect, with numerous short, leafy, lateral branches. Leaves clustered on distant to closely spaced, short, lateral shoots; sheaths 4–6 mm long, rounded, smooth, shiny, glabrous or puberulent at the base; ligules thickly membranous ciliate rims; blades 0.5–1.5 cm long, 1–2(3) mm wide, stiff, subulate, uniformly many-veined. Inflorescences terminal, composed of a single glabrous spikelet, this enclosed, and almost concealed, by the uppermost leaf sheaths. Pistillate spikelets subterete, with 3–5 florets, distal

florets rudimentary; disarticulation tardy, below the lowest floret; glumes absent; lemmas coriaceous, glabrous, 9-veined, acute; paleas coriaceous, keels prominently winged, wings overlapping and enclosing the caryopses. Staminate spikelets similar to the pistillate spikelets, but smaller and the glumes and lemmas thinner.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Distichlis littoralis* grows in moist, sandy, saline soils along the coast of southern California and the southeastern United States, northeastern Mexico, and the Caribbean Islands. It was previously placed in *Monanthochloë*, but Bell and Columbus (2008) demonstrated that *Monanthochloë* is nested within *Distichlis*.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

117. *Distichlis spicata* (L.) Greene, Bull. Calif. Acad. Sci. 2: 415. 1887. *Uniola spicata* L., Sp. Pl. 71. 1753.

FIGURE 86

Plants rhizomatous and sometimes stoloniferous. Culms 10–60 cm long, usually erect, sometimes decumbent or prostrate. Blades of upper leaves 1–8(20) cm long, rigid and divaricate to lax and ascending, usually equaling or exceeding the pistillate panicles, varying with respect to the staminate panicles. Pistillate panicles 1–7 cm long, often congested, with 2–20 spikelets. Pistillate spikelets 5–20 mm long, 4–7 mm wide, with 5–20 florets; lower glumes 2–3 mm long; upper glumes 3–4 mm long; lemmas 3.5–6 mm long; paleas with serrate keels. Caryopsis 2–5 mm long, tapered or truncate. Staminate panicles and spikelets similar to the pistillate panicles and spikelets, but the lemmas somewhat thinner in texture and the paleas not bowed-out; anthers 3–4 mm long.  $2n = 40$ .

DISTRIBUTION AND HABITAT. *Distichlis spicata* grows in saline soils of the Western Hemisphere and Australia and has three varieties; only *Distichlis spicata* var. *mexicana* Beetle is found in Chihuahua.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Asunción: ca 65 (air) mi SW of Cd. Juárez, 6.8 (rd) mi N of Guzman, in saline flats of, 14 Sep 1974, 1162 m J. Henrickson 14104 (MEXU, NMC), 14110 (US). Camargo: Cerca [near] de laguna de Jaco, 3 Aug 1976, orilla de laguna [shore of lagoon], 1220 m, S. González & J.M. Peña 509 (RELC). Chihuahua: Balneario de San Diego, 11 Aug 1976, comunidad halófito [halophyte community], 1170 m, J.M. Peña JNP-153 (RELC). Delicias: 14 km al N of Delicias on road from Chihuahua to Delicias, 29 Jun 1974, weedy vegetation in irrigated area, S.D. Koch 74154 (MEXU). Galeana: km 145 de Galeana, 8 Aug 1979, pastizal [pastureland], 1370 m, M. Siqueiros 296 (MEXU). Gómez Farías: Laguna de Babicora, 18 Aug 1994, 2150 m, T. Lebgue & E. Estrada 3489 (NMC); Laguna Babicora, 9 Sep 1994, 2150 m, G. Quintana & E. Estrada 3507 (NMC). Janos: near Mexican boundary line, 16 Jun 1892, E.A. Mearns 266 (US). Juárez: Rio Grande bottom, 12 Jun 1912, E. Stearns 335 (US); Ciudad Juárez, a lo largo de [along] la “Asequia Madre” entre [between] la Av. Américas & Paseo Triunfo de la República, 29 Sep 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6399 (UACJ). Madera: Laguna de Babicora, alrededores de [around] Nicolas Bravo, 18 Aug 1994, 2200 m, Quintana, Lebgue & Estrada 3572 (NMC). Meoqui: ca 1 mi S of Meoqui, 18 Aug 1959, D. Marsh 1905 (US); 14 km N of Delicias on rd from Chihuahua to Delicias, 29 Jun 1974, S.D. Koch 74153 (US). Práxedes G. Guerrero: aprox. 3 km al NW del Porvenir, por la carr. [hwy] Juárez–Porvenir, a los lados de cultivo de algodón [near cultivated cotton], 8 Sep 1994, 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5411 (UACJ).

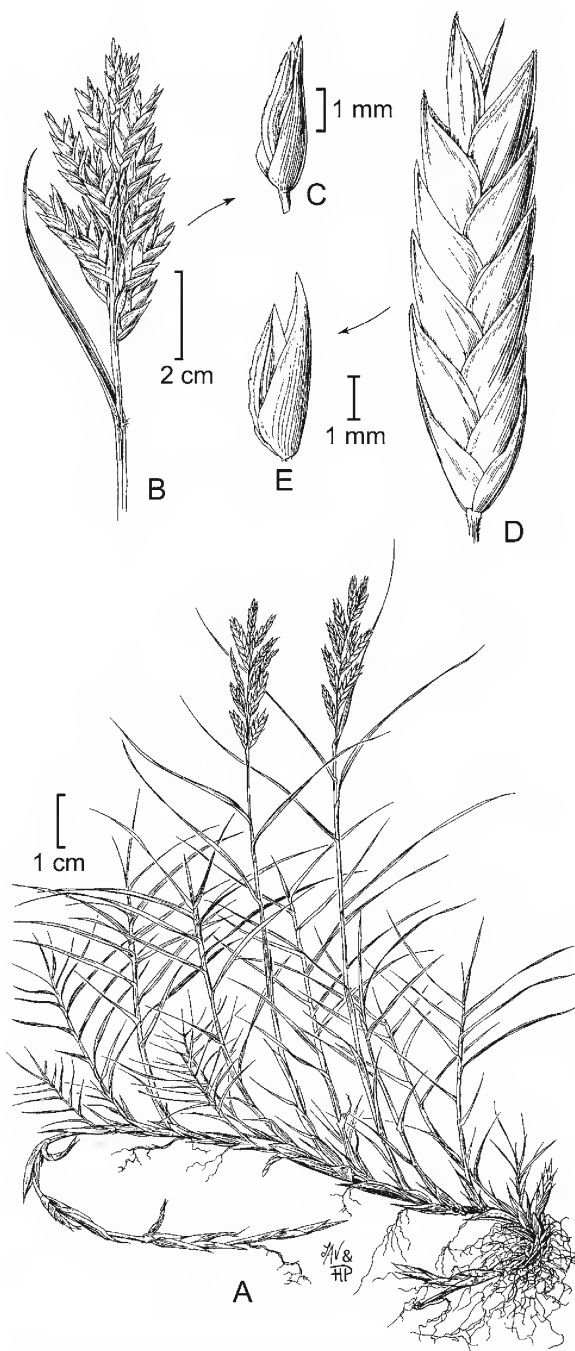


FIGURE 86. *Distichlis spicata*. A. Staminate habit. B. Pistillate inflorescence. C. Pistillate floret. D. Staminate spikelet. E. Staminate floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

***Echinochloa* P. Beauv.**

Annual or perennial; with or without rhizomes. Culms 10–460 cm tall, prostrate, decumbent or erect, distal portions sometimes floating, sometimes rooting at the lower nodes; nodes usually glabrous; internodes hollow or solid. Sheaths open, compressed; auricles absent; ligules usually absent but, if present, of hairs; blades linear to linear-lanceolate, usually more than 10 times longer than wide, flat, with a prominent midrib. Inflorescences terminal, panicles of simple or compound spike-like branches attached to elongate rachises, axes not terminating in a bristle, spikelets subsessile, densely packed on the angular branches; disarticulation below the glumes (cultivated taxa not or tardily disarticulating). Spikelets plano-convex, with 2(3) florets; lower florets sterile

or staminate; upper florets bisexual, dorsally compressed; glumes membranous; lower glumes usually  $\frac{1}{4}$ – $\frac{2}{5}$  as long as the spikelets (varying to more than  $\frac{1}{2}$  as long), unawned to minutely awn-tipped; upper glumes unawned or shortly awned; lower lemmas similar to the upper glumes in length and texture, unawned or awned, awns to 60 mm; lower paleas vestigial to well-developed; upper lemmas coriaceous, dorsally rounded, mostly smooth, apex short or elongate, firm or membranous, unawned; upper paleas free from the lemmas at the apex; lodicules absent or minute; anthers 3. Caryopsis ellipsoid, broadly ovoid or spheroid; embryos usually 0.7–0.9 times as long as the caryopsis.  $x = 9$ .

*Echinochloa* is a tropical to warm-temperate genus of 40–50 species that are usually associated with wet or damp places. Seven species are present in Chihuahua.

**KEY TO SPECIES OF *ECHINOCHLOA***

1. Ligules of stiff hairs present on the lower leaves; perennial.
  2. Awns 40–50 mm long, lower floret sterile . . . . . *E. holciformis*
  2. Awns 5–20 mm long; lower floret staminate . . . . . *E. polystachya*
1. Ligules usually absent from all leaves, the ligule region sometimes pubescent; plants usually annual, sometimes short-lived perennials.
  3. Panicle branches 0.7–2(4) cm long, without secondary branches; spikelets 2–3 mm long, unawned . . . . . *E. colona*
  3. Panicle branches 1–14 cm long, usually rebranched, the secondary branches often short and inconspicuous; spikelets 2.5–5 mm long, awned or unawned.
    4. Upper lemmas broadly ovate to elliptical, if elliptical, then each with a line of minute (use 25× magnification) hairs across the base of the early withering tips
      5. Upper lemmas with rounded or broadly acute coriaceous apex that passes abruptly into a membranous tip, a line of minute hairs present at the base of the tip . . . . . *E. crus-galli*
      5. Upper lemmas with acute or acuminate coriaceous apex that extend into the membranous tip, without hairs at the base of the tip . . . . . *E. muricata*
    4. Upper lemmas narrowly ovate to elliptical, never with a line of minute hairs across the base of the early withering, membranous tips.
      6. Spikelets 2.5–3.4 mm long; lower lemmas unawned or with awns 3–10(15) mm long, curved . . . . *E. crus-pavonis*
      6. Spikelets 3–5 mm long; lower lemmas usually with awns 8–25 mm long, typically straight.
        7. Blades 10–35(60) mm wide; sheaths usually hirsute and the margins ciliate with prominent papillose-based hairs, sometimes the sheaths only papillose; lower lemmas awned, the awns 8–25(60) mm long . . . . *E. walteri*
        7. Blades 5–10 mm wide; sheaths glabrous or with papillose-based hairs; lower lemmas unawned or awned, the awns 8–16(50) mm long . . . . . *E. oplismenoides*

118. *Echinochloa colona*\* (L.) Link, Hort. Berol. 2: 209. 1833.  
*Panicum colonum* L., Syst. Nat. (ed. 10) 2: 870. 1759.

FIGURE 87

Annual; erect or decumbent, caespitose or spreading, rooting from the lower cauline nodes. Culms 10–70 cm tall; lower nodes glabrous or hispid, hairs appressed; upper nodes glabrous. Sheaths glabrous; ligules absent, ligule region frequently brown-purple; blades 8–22 cm long, 3–6(10) mm wide, mostly glabrous, sometimes hispid, hairs papillose-based on or near the margins. Panicles 2–12 cm long, erect, rachises glabrous or sparsely hispid; primary branches 5–10, 0.7–2(4) cm long, erect to ascending, spike-like, somewhat distant, without secondary branches, axes glabrous or sparsely hispid, hairs 1.5–2.5 mm

long, papillose-based. Spikelets 2–3 mm long, disarticulating at maturity, pubescent to hispid, hairs usually not papillose-based, tips acute to cuspidate; lower glumes about  $\frac{1}{2}$  as long as the spikelets; upper glumes about as long as the spikelets; lower florets usually sterile, occasionally staminate; lower lemmas unawned, similar to the upper glumes; lower paleas subequal to the lemmas; upper lemmas 2.6–2.9 mm long, not or sparsely exceeding the upper glumes, elliptic, coriaceous portion rounded distally, passing abruptly into a sharply differentiated, membranous, soon-withering tip; anthers 0.7–0.8 mm long. Caryopsis 1.2–1.6 mm long, whitish; embryos 63%–83% as long as the caryopsis.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Echinochloa colona* is widespread in tropical and subtropical regions. It is





FIGURE 87. *Echinochloa colona*. A. Habit. B. Spikelet showing lower glume and lower lemma. C. Spikelet showing upper glume. D. Upper lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

adventive and weedy in North America, growing in low-lying, damp to wet, disturbed areas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 44 km al N del poblado [village] Villa Ahumada por la carr. [hwy] Panamericana (Méx 45), 7 Oct 1995, 1200 m, R. Corral, P. Olivas & J.O. Torres RCD6437 (UACJ). **Aldama:** km 38, Cd. Chihuahua–Hormigas, N of V. Aldama, 31 Oct 1954, matorral xerófilo [xerophilous scrub], 1100 m, *Hern.-Xol.* & C. Tapia N-518 (US). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7600 (US). **Chihuahua:** Chihuahua, 14 Oct 1910, *Hitchcock* 7780 (US); 50 mi W of Chihuahua, 15 Oct 1935, *LeSueur Mex-042*, *Mex-081* (US); 12 mi N of Chihuahua on rd to Cd. Juárez, 8 Oct 1959, 1800 m, *Soderstrom* 934 (US). **Cuauhtémoc:** About 10 mi SE of Bachimba along hwy 7, 11 Jul 1950, *Reeder*, C. *Reeder* & *Goodding* 1248 (ENCB). **Gran Morelos:** km 20, Cd. Cuauhtémoc de Cd. Chihuahua, 27 Oct 1954, 1500 m, *Hern.-Xol.* & C. Tapia N-278 (US). **Guachochi:** Small spring below Napuchis, 2 Sep 2003, vegetación acuática [aquatic vegetation], P.M. Peterson & P. Catalán 17661 (US). **Jiménez:** Sta Eulalia Mts, E. Wilkinson 42 (US); Bank of the Río Florido, Cd. Jiménez, 28 Jul 1939, 1340 m, L. H. Harvey 1330 (ENCB, US); Reserva de la Biosfera de Mapimí, Laguna Palomas, 31 Oct 1998, matorral xerófilo, 1055 m, A. García 3171 (CIIDIR). **Juárez:** Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadow and irrigation canals], 1120 m, R. Corral RCD6295 (UACJ); Práxedes G. Guerrero: aprox. 3 km al NW del Porvenir, por la carr. Juárez–Porvenir, a los lados de cultivo de algodón [near cultivated cotton], 8 Sep 1994, 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5401 (UACJ); Rancho Escuela, 18 Oct 1997, I. Enriquez, S. Ordoñez, L. Sushii, S. Carrasco, A. Perales & N. Loya IEA11 (UACJ). **Meoqui:** Lázaro Cárdenas, 7 Aug 1974, suelo arcilloso, arvense en el algodón [clay soil, growing in cotton], 1250 m, C. Rodríguez, O. Agundis, S. Acosta 1221 (ENCB); Entre [between] Julimes & Felipe Ángeles, 30 Jul 1976, cañada [glen] con *Prosopis baccharis*, 1295 m, S. González & J.M. Peña 373 (ENCB, RELC). **Ojinaga:** 1 km al Pte. del rancho Escobilla, 30 Oct 76, matorral, Valdés-Reyna VR-833 (RELC). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7955 (US); Nuevo Majalca, approx. 14.5 km W of hwy 45, N of Chihuahua, 22 Sep 1988, grassland, 1700 m, P.M. Peterson & Annable 5771 (ENCB, US).

119. *Echinochloa crus-galli*\* (L.) P. Beauv., Ess. Agrostogr. 1: 53, 161, 169, t. 11, f. 2. 1812. *Panicum crus-galli* L., Sp. Pl. 1: 56. 1753.

FIGURE 88

Annual. Culms 30–200 cm tall, spreading, decumbent or stiffly erect; nodes usually glabrous or the lower nodes puberulent. Sheaths glabrous; ligules absent, ligule region sometimes pubescent; blades to 65 cm long, 5–30 mm wide, usually glabrous, occasionally sparsely hirsute. Panicles 5–25 cm long, with



few to many papillose-based hairs at or below the nodes of the primary axes, hairs sometimes longer than the spikelets; primary branches 1.5–10 cm long, erect to spreading, longer branches with short, inconspicuous secondary branches, axes scabrous, sometimes also sparsely hispid, hairs to 5 mm long, papillose-based. Spikelets 2.5–4 mm long, 1.1–2.3 mm wide, disarticulating at maturity; upper glumes about as long as the spikelets; lower florets sterile; lower lemmas unawned to awned, sometimes varying within a branch, the awns to 50 mm long; lower paleas subequal to the lemmas; upper lemmas broadly ovate to

elliptical, coriaceous portion rounded distally, passing abruptly into an early withering, acuminate, membranous tip that is further demarcated from the coriaceous portion by a line of minute hairs (use 25× magnification); anthers 0.5–1 mm long. Caryopsis 1.3–2.2 mm long, 1–1.8 mm wide, ovoid or oblong, brownish; embryos 59%–86% as long as the caryopsis.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Echinochloa crus-galli* is an Eurasian species that is now widely established in North America, where it grows in moist, disturbed sites, including rice fields.

#### KEY TO VARIETIES OF *ECHINOCHLOA CRUS-GALLI*

1. Racemes 10–20(25) mm long, simple or branched, open; spikelets hirsute and papillose, sometimes purple-mottled . . . . . *E. crus-galli* var. *crus-galli*
1. Racemes 8–10(14) mm long, simple, plicate; spikelets sparsely papillose, generally green throughout . . . . . *E. crus-galli* var. *zelayensis*

*Echinochloa crus-galli* (L.) P. Beauv. var. *crus-galli*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6465 (UACJ). **Aldama:** San Diego de Alcalá por la carr. [hwy] Chihuahua–Delicias, matorral-pastizal [scrub–pastureland], 20 Aug 1996, 1200 m, E. Estrada & C. Yen 5709 (ENCB). **Ascensión:** Col. Guadalupe Victoria, 11 Aug 1981, zona agrícola [agricultural zone], 1220 m, M.E. Siqueiros 1827 (ENCB). **Casas Grandes:** Valle de las Cuevas al S del Ejido Ignacio Zaragoza, bosque de pino [pine forest], 25 Sep 1982, 1760 m, Tenorio & Romero 1711 (ENCB). **Chihuahua:** 50 mi W of Chihuahua, 15 Oct 1935, LeSueur Mex-043 (US); Río Bonito, 25 Aug 1936, LeSueur Mex-095 (US); La Campana; 4 km al Ote. [W] carr. Panamericana, 6 Sep 73, maleza en lote de producción de semilla [weed in seed-production lot], 1500 m, Valdés-Reyna VR-113 (RELC). Orilla [shore] de Río Chiviacar, 7 Aug 73, lugar pantanoso [marshy place] con *Typha*, 1450 m, J.M. Peña JMP-69 (RELC). **Gómez Farías:** Laguna de Babicora, 18 Aug 1994, 2150 m, T. Lebgue & E. Estrada 3308, 3310-A (NMC). **Guerrero:** Entre [between] La Junta & Temochi, 12 Aug 76, Pastizal, 2135 m, S. González & J.M. Peña 576A (RELC). **Juárez:** Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadow and irrigation canals], 1120 m, R. Corral RCD6288 (UACJ); km 40 carr. No. 2, a los lados [sides] del canal de riego, 8 Sep 1994, 1100 m, R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5441-A (UACJ); Ciudad Juárez a lo largo de [along] la “Asequia Madre” al N del fracc. Rincones de San Marcos, 13 Oct 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6539 (UACJ). **Madera:** Chuichupa, Aug 1936, LeSueur 085 (US); Arroyo de la Quinta, ejido “El Largo”, 13 Oct 1990, bosque de pino, 2340 m, A. Benítez 1867 (CIIDIR). **Meoqui:** Lázaro Cárdenas, 7 Aug 1974, arvense en el algodón [growing in cotton], 1250 m, C. Rodríguez, O. Agundis & S. Acosta 1218 (US). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” ca. 130 air km W of Cuauhtemoc, 12 Sep 1987, 1600 m, Spellenberg & D. Jewell 9296 (NMC). **Riva Palacio:**

Parque cumbres de Majalca, 13 sep 1997, pino–encino–pastizal [pine–oak–pastureland], 2120 m, C. Yen & E. Estrada 8530 (ENCB). **Temosachi:** Nabogame, 7 Sep 1987, 1800 m, Laferr. 1026 (NMC).

*Echinochloa crus-galli* var. *zelayensis* (Kunth) Hitchc., Man. Grass. U.S. 841. 1935. *Oplismenus zelayensis* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 108. 1815.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes:** near Casas Grandes, 26 Sep 1899, C.H.T. Townsend & C.M. Barber 353 (US). **Chihuahua:** 50 mi W of Chihuahua, 15 Oct 1935, LeSueur Mex-043 (US); km 15 V. Guerrero–Sto. Tomás, 29 Oct 1954, Hern.-Xol. & C. Tapia N-379 (US). **Madera:** Río Aros, 23 Aug 1937, LeSueur 0178 (US). **Nuevo Casas Grandes:** E of Nuevo Casas Grandes 23 Oct 1954, Hern.-Xol. & C. Tapia N-12 (US). **Riva Palacio:** Majalca (Pilarés), 12 Aug 1939, 2075 m, L. H. Harvey 1490 (US).

120. *Echinochloa crus-pavonis* (Kunth) Schult., Mant. 2: 269. 1824. *Oplismenus crus-pavonis* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 108. 1815.

FIGURE 89

Annual or short-lived perennial. Culms 30–150 cm tall; nodes glabrous. Sheaths glabrous, often purplish; ligules absent; blades 12–60 cm long, 10–25 mm wide, glabrous. Panicles 10–30 cm long, erect or drooping, nodes sparsely hispid, hairs papillose-based, internodes glabrous; primary branches to 14 cm long, nodes sometimes sparsely hispid, hairs papillose-based, internodes usually glabrous; secondary branches to 3 cm. Spikelets 2.5–3.4 mm long, 1.2–1.4 mm wide, disarticulating at maturity; upper glumes subequal to the spikelets; lower florets sterile; lower lemmas unawned or awned, awns 3–10(15) mm long, curved; lower paleas absent, vestigial, or well-developed; upper lemmas narrowly elliptic, not or sparsely exceeding the upper glumes, acute or obtuse, with a well-differentiated, early

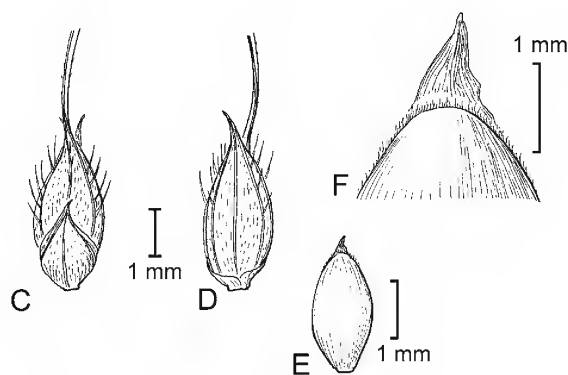
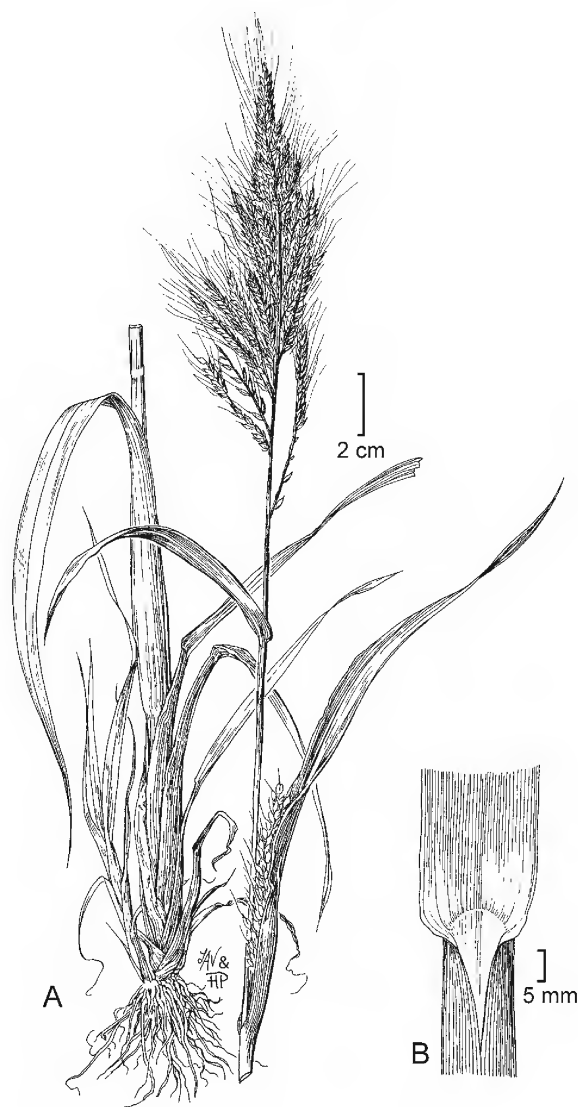


FIGURE 88. *Echinochloa crus-galli*. A. Habit. B. Ligule. C. Spikelet showing lower glume and lower lemma. D. Spikelet showing upper glume. E. Upper lemma. F. Apex of upper lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



withering tip, glabrous or pubescent at the base of the tip, hairs not forming a line across the base; anthers 0.5–0.7 mm long. Caryopsis 1.2–1.5 mm long, 1–1.3 mm wide; embryos 50%–70% as long as the caryopsis.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Echinochloa crus-pavonis* is a native species found in scattered locations from British Columbia to Arizona, east to Florida, and south into Mexico to South America. It favors marshes and wet places at lower elevations, often being found in the water. It has about four varieties, *Echinochloa crus-pavonis* var. *crus-pavonis* is in our study area.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Casas Grandes: between Casas Grandes and Sabinal, 4–5 Sep 1899, E.W. Nelson 6355-A (US).

120. *Echinochloa holciformis* (Kunth) Chase, Proc. Biol. Soc. Wash. 24: 155. 1911. *Oplismenus holciformis* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 107. 1815.

Perennial; caespitose. Culms 100–150(200) cm tall, decumbent at the base, rooted at the inferior nodes, glabrous. Sheaths glabrous; ligules 1.5–3.5 mm long, a dense row of rigid hairs; blades 30–45 cm long, 8–15 mm wide, scabrous on the margins. Panicles 15–40 cm long, dense, lightly pendulous, racemes numerous, 6–8 cm long, rachis scabrous and sparsely hispid, spikelets in 4 rows or irregularly grouped, changing to purple or black at maturity, the awns stay green or sometimes purple mottled. Spikelets 6.5–9 mm long, densely hispid, with short-plicate hairs; lower glumes 2.6–3.9 mm long, 3-veined, mucronate, upper glumes 6.5–7 mm long, 5-veined mucronate. Lemma of inferior floret sterile, 5-veined, the awn 30–55 mm long; palea missing; superior floret bisexual, lemma of the bisexual floret 5.5–6 mm long, acute, mucronate or awned, awn 1.5–3 mm long; anthers 0.7–1.1 mm long.

**DISTRIBUTION AND HABITAT.** *Echinochloa holciformis* is an aquatic or subaquatic species known from Mexico and Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Madera: Col. García, 2 Sep 1990, pastizal [pastureland], 2240 m, A. Benítez 2192 (CIIDIR).

121. *Echinochloa muricata* (P. Beauv.) Fernald, Rhodora 17(198): 106. 1915.

FIGURE 90

Annual. Culms 80–160 cm tall, erect or spreading, sometimes rooting at the lowest nodes, often developing short axillary

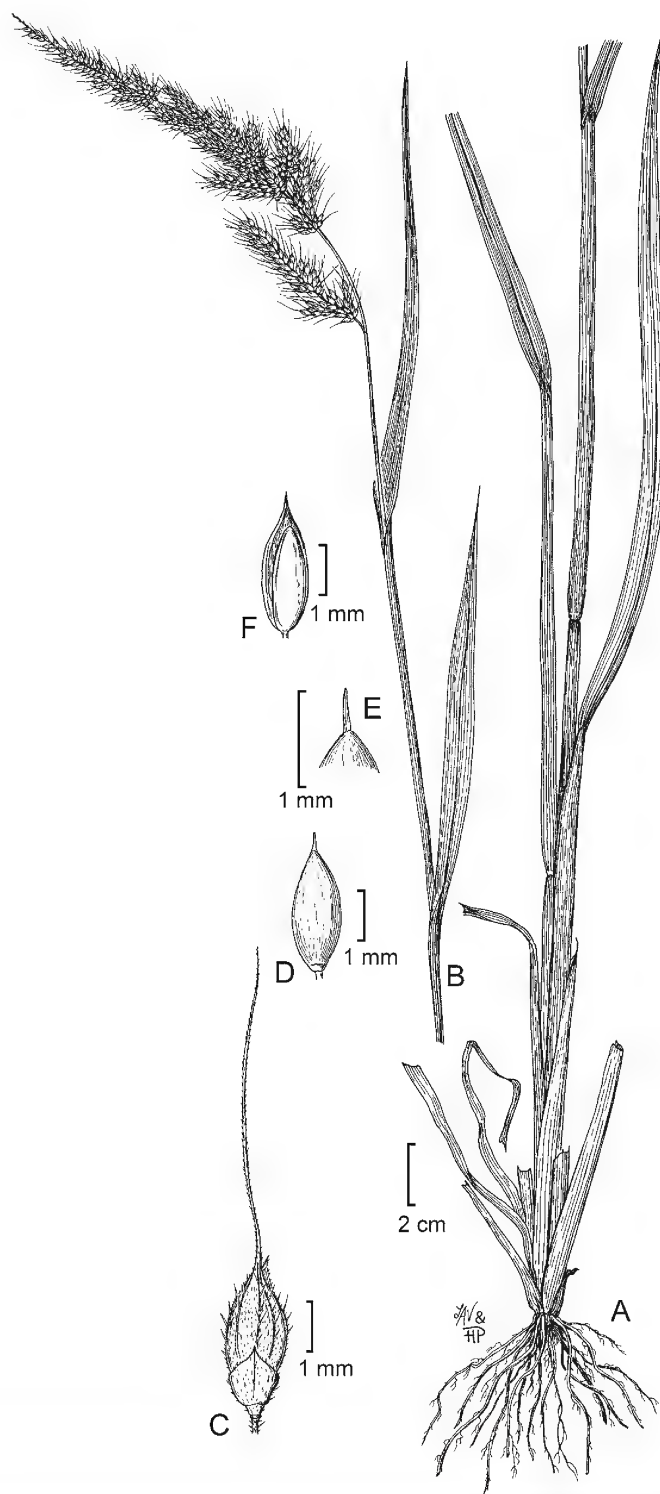


FIGURE 89. *Echinochloa crus-galli*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Upper floret, dorsal view. E. Apex of upper floret. F. Upper floret, ventral view showing palea. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

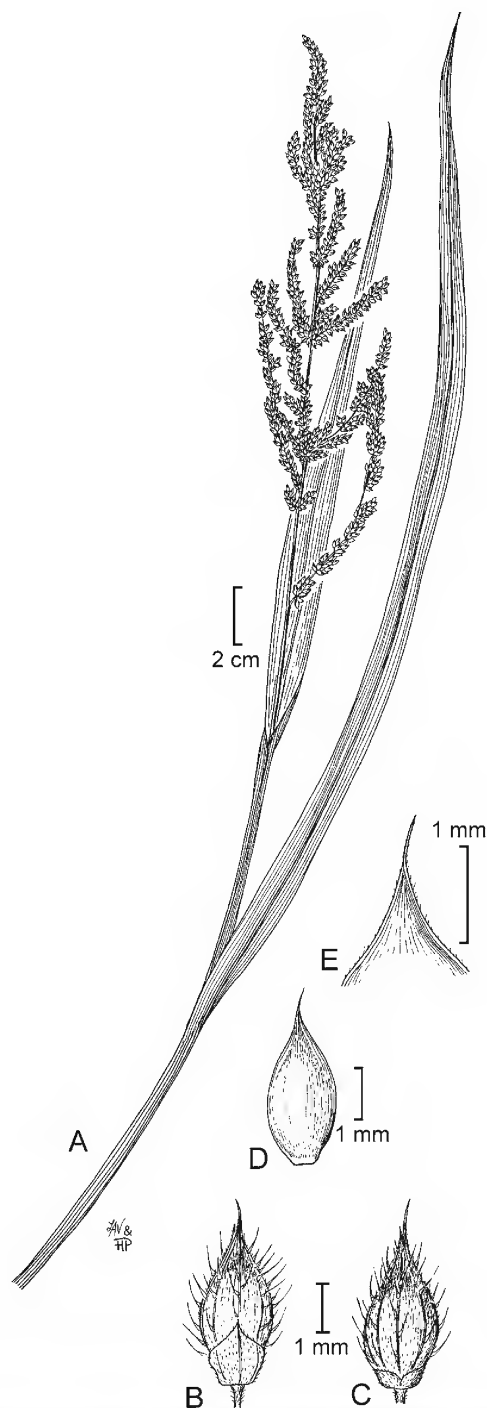


FIGURE 90. *Echinochloa muricata*. A. Culm and inflorescence. B. Spikelet showing lower glume and lower lemma. C. Spikelet showing upper glume. D. Upper lemma. E. Apex of upper lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

flowering shoots at most upper nodes when mature; lower nodes glabrous or puberulent; upper nodes glabrous. Sheaths glabrous; ligules absent; blades 1–27 cm long, 0.8–30 mm wide. Panicles of primary culms 7–35 cm long, rachises and branches glabrous or hispid, hairs to 3 mm long, papillose-based; primary branches 2–8 cm long, usually spreading and rather distant, often with secondary branches. Spikelets 2.5–5 mm long, disarticulating at maturity, usually purple or streaked with purple, usually hispid, hairs papillose-based; upper glumes about as long as the spikelets; lower florets sterile; lower lemmas unawned or awned, awns to 16 mm; lower paleas well-developed; upper lemmas broadly obovoid or orbicular, narrowing to an acute or acuminate coriaceous portion that extends into the membranous tip, boundary between the coriaceous and membranous portions not marked by minute hairs; anthers 0.4–1.1 mm long. Caryopsis 1.2–2.5 mm long, broadly obovoid or spheroid, yellowish; embryos 1.4–2 mm long, 80%–91% as long as the caryopsis.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Echinochloa muricata* is native to North America, growing from southern Canada to northern Mexico in moist, often disturbed sites (but not rice fields). It resembles *E. crus-galli* in gross morphology and ecology but differs consistently by not having a line of minute hairs separating the tip of the lemma from the coriaceous base. There are two varieties; only *Echinochloa muricata* var. *microstachya* Wiegand is in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: SW Chihuahua, Aug 1885, *E. Palmer* 18 (US). Chihuahua: near Chihuahua, 20 Jul 1936, *LeSueur* 0135 (US). Madera: Río Aros, 23 Aug 1937, *LeSueur* 0179, 0180, 0181, 0182 (US); between Col. García and Pratt's Rancho below Pacheco, 22–24 Aug 1899, *E.W. Nelson* 6244 (US).

122. *Echinochloa oplismenoides* (E. Fourn.) Hitchc., Contr. U.S. Natl. Herb. 22(3): 136, f. 27. 1920. *Berchtoldia oplismenoides* E. Fourn., Mexic. Pl. 2: 41. 1886.

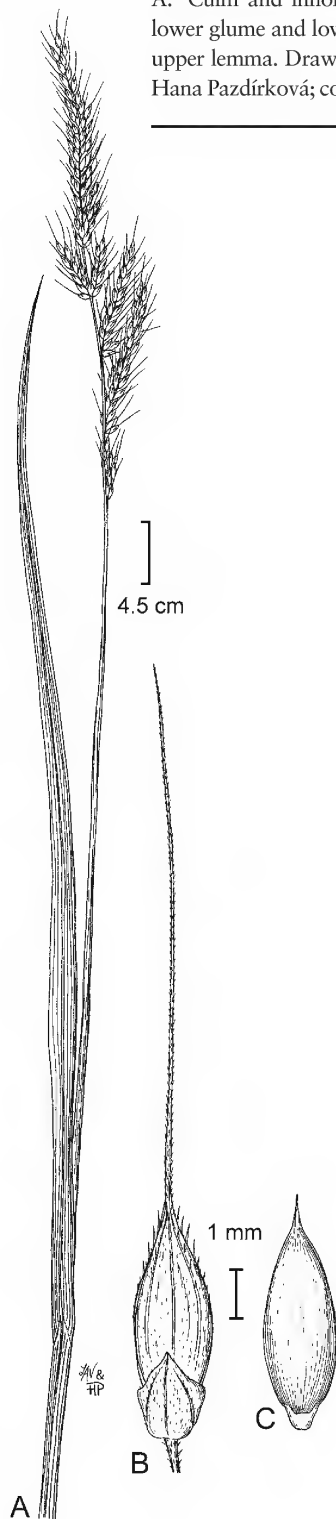
FIGURE 91

Annual. Culms to 100 cm tall, erect, succulent, glabrous, branching from the lower nodes. Sheaths glabrous or hirsute with papillose-based hairs; ligules absent or the ligule region pubescent; blades 10–35 cm long, 5–10 mm wide. Panicles 15–30 cm long, narrow; primary branches appressed to ascending, with papillose-based hairs at the base of the spikelets. Spikelets 4–5 mm long, disarticulating at maturity; glumes with hairs over the veins, glabrous, scabrous, or hirsute between the veins; upper glumes about equal to the spikelets, mucicous or awned, awns to 1 mm; lower florets sterile; lower lemmas unawned or awned, the awns 8–16(50) mm long; lower paleas absent or hyaline and subequal to the lemmas; upper lemmas 4–4.5 mm long, 1.7–1.9 mm wide, elliptic; anthers 0.5–0.7 mm long, purple. Caryopsis 2.7–2.9 mm long, 1.7–1.8 mm wide, elliptic in outline, mucronate; embryos about 75% as long as the caryopsis; hila obovate.

**DISTRIBUTION AND HABITAT.** *Echinochloa oplismenoides* was previously known from northwestern Mexico to Guatemala; it is now found in southern Arizona (Fishbein, 1995).



FIGURE 91. *Echinochloa oplismenoides*. A. Culm and inflorescence. B. Spikelet showing lower glume and lower lemma. C. Floret showing upper lemma. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



SPECIMENS EXAMINED. MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, *H.S. Hitchcock* 7696 (US). **Cuauhtémoc:** 11 mi W of Cuauhtémoc, 4 Sep 1967, oak forest, 7000 ft, *Reeder & C. Reeder* 4846 (ENCB). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7758 (US); Sierra Madre, porphyry ledges near Guerrero, 18 Oct 1887, *C.G. Pringle* 1404 (US). **Madera:** 10 km al N de Madera, 6 Oct 74, bosque de pino-encino [pine-oak forest], 2100 m, *Valdés-Reyna* VR-676 (RELC). **Riva Palacio:** Majalca, 24 Jun 1936, *LeSueur* 0117 (US); Majalca, Canon Encantado, 24 Jul 1936, *LeSueur* Mex-096 (US).

123. *Echinochloa polystachya* (Kunth) Hitchc., Contr. U.S. Natl. Herb. 22(3): 135, f. 26. 1920.

Perennial; not rhizomatous. Culms 1–2 m tall, to 1 cm thick, erect or decumbent and rooting at the lower nodes, upper portion sometimes floating distally; nodes glabrous or antrorsely villous. Sheaths mostly glabrous, minutely puberulent, or hispid, hairs papillose-based, throat hispid; ligules 1–5 mm long, present on the lower leaves, of stiff hairs; blades 15–70 cm long, 5–13 mm wide, glabrous. Panicles 13–45 cm long, erect, rachis nodes hispid, hairs 3–6.5 mm long, papillose-based, internodes scabrous; primary branches 4–10 cm long, subverticillate, ascending, nodes hispid, hairs 2.5–4 mm long, papillose-based, internodes scabrous; secondary branches short, spikelets subsessile, in clusters. Spikelets 4–7 mm long, hispid, hairs appressed, disarticulating at maturity; lower glumes at least  $\frac{1}{2}$  as long as the spikelets; lower florets staminate; lower lemmas apiculate or awned, awns to 18 mm; lower paleas subequal to the lower lemmas, often purple; anthers of lower florets 1.5–3.6 mm long, orange; upper lemmas 2.5–5 mm long, elliptic or narrowly ovate, apex obtuse, with a membranous, soon-withering tip; anthers of upper florets shorter than those of the lower florets. Caryopsis to 3 mm long.  $2n = 54$ .

DISTRIBUTION AND HABITAT. *Echinochloa polystachya* grows in coastal marshes, often in standing water, from Texas to Louisiana and south through Mexico and the Caribbean Islands to Argentina. *Echinochloa polystachya* var. *polystachya* is found in Mexico; it has glabrous culms and sheaths; *Echinochloa polystachya* var. *spectabilis* (Nees ex Trin.) Mart. Crov., has swollen, pubescent cauline nodes and pubescent sheaths.

SPECIMENS EXAMINED. MEXICO. Chihuahua. **Manuel Benavides:** entre [between] Manuel Benavides & Pocitos, 2 Aug 1976, pastizal [pastureland], 1342 m, *S. González & J.M. Peña* 452 (RELC).

124. *Echinochloa walteri* (Pursh) A. Heller, Cat. N. Amer. Pl. ed. 2, p. 21. 1900. *Panicum walteri* Pursh, Fl. Amer. Sept. 1: 66–67. 1814.

FIGURE 92

Annual. Culms (30)50–200+ cm tall, to 2.5 cm thick; nodes pilose or villous, upper nodes usually with sparser and shorter pubescence, occasionally glabrous. Lower sheaths usually hispid, hairs papillose-based, sometimes just papillose; upper sheaths



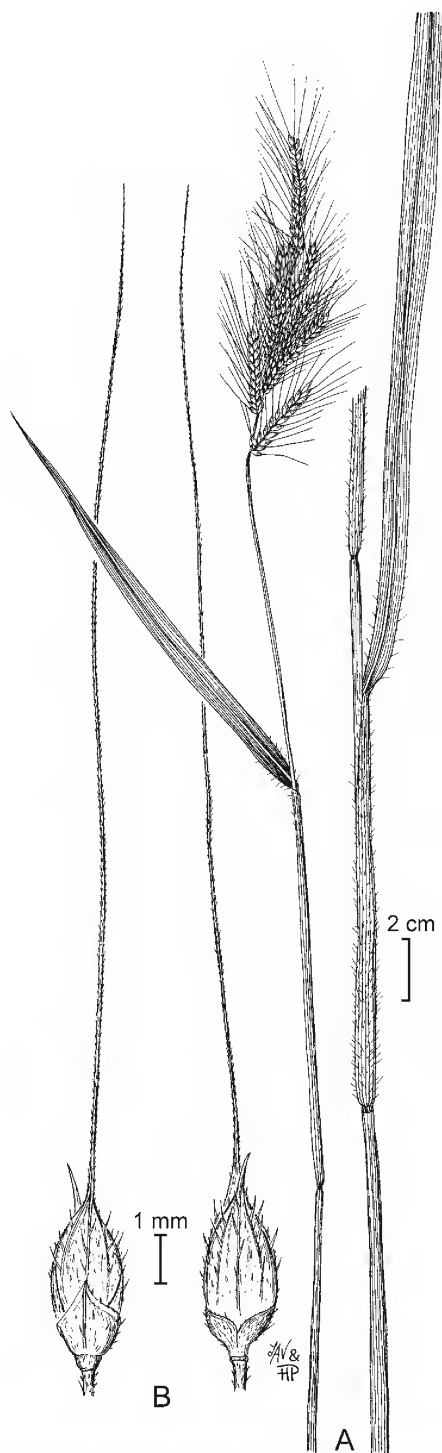


FIGURE 92. *Echinochloa walteri*. A. Culm and inflorescence. B. Spikelets showing lower glume and lower lemma on left; upper glume on right. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

hirsute or glabrous; ligules absent; blades to 55 cm long, 10–35(60) mm wide, scabrous. Panicles 8.5–35 cm long, erect to slightly drooping, nodes hispid, hairs 3.5–5 mm long, papillose-based, sometimes sparsely so, internodes usually glabrous, sometimes hispid, hairs papillose-based; primary branches 1–10 cm long, loosely erect, not concealed by the spikelets, nodes usually hispid, hairs papillose-based, sometimes glabrous, internodes scabrous, sometimes also sparsely hispid, hairs papillose-based; secondary branches present on the longer primary branches. Spikelets 3–5 mm long, disarticulating at maturity, scabrous to variously muricate and hairy, hairs usually not papillose-based, margins sometimes with a few papillose-based hairs; lower glumes usually more than ½ as long as the spikelets, abruptly narrowing to a fine, 0.5 mm point; lower florets sterile; lower lemmas usually awned, the awns 8–25(60) mm long; lower paleas subequal to the lower lemmas; upper lemmas 3–5 mm long, about 1.5 mm wide, not or sparsely exceeding the upper glumes, narrowly ovate to elliptical, coriaceous portion subacute, tips acuminate, membranous, without a line of hairs at the base of the tip; anthers 0.6–1(1.2) mm long. Caryopsis 1.2–1.8 mm long, brownish.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Echinochloa walteri* grows in wet places, often in shallow water and brackish marshes. It is a native species, found in both disturbed and undisturbed sites, although not in rice fields. Occasional specimens of *E. walteri* with glabrous lower sheaths and short awns can be distinguished from *E. crus-gavonis* by having less dense panicles.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

### *Eleusine* Gaertn.

Annual or perennial; caespitose. Culms 10–150 cm tall, herbaceous, glabrous, branching both at and above the base. Sheaths open; ligules membranous, ciliate. Inflorescences terminal, panicles of (1)2–20 nondisarticulating, spike-like branches, exceeding the upper leaves; branches 1–17 cm long, all or most in a digitate cluster, sometimes 1(2) branch(es) attached immediately below the terminal whorl, axes flattened, terminating in a functional spikelet. Spikelets 3.5–11 mm long, laterally compressed, with 2–15 bisexual florets; disarticulation above the glumes and between the florets. Glumes unequal, shorter than the lower lemmas; lower glumes 1- to 3-veined; upper glumes 3- to 5(7)-veined; lemmas 3-veined, glabrous, keeled, apex entire, neither mucronate nor awned; paleas sometimes with winged keels; anthers 3, 0.5–1 mm long; ovaries glabrous. Fruit modified caryopsis, pericarp thin, separating from the seed at an early stage in its development; seeds usually obtusely trigonous, the surfaces ornamented.  $x = 8, 9, 10$ .

Eight of the nine species of *Eleusine* are native to Africa, where they grow in mesic to xeric habitats. One species is native in South America; three species are introduced to Mexico, and two of these are present in Chihuahua.

KEY TO SPECIES OF *ELEUSINE*

1. Spikes 1–3 cm long, 6–10(12) mm wide; rachis prominently winged and toothed; upper glume keel winged ..... *E. multiflora*  
 1. Spikes 4–15 cm long, 2–4 mm wide; rachis wingless or winged with an entire (not toothed) wing, upper glume keel not winged ..... *E. indica*

125. *Eleusine indica*\* (L.) Gaertn., Fruct. Sem. Pl. 1: 8. 1788.  
*Cynosurus indicus* L., Sp. Pl. 1: 72–73. 1753.

FIGURE 93

Annual. Culms 30–90 cm tall, erect or ascending, somewhat compressed; lower internodes 1.5–2 mm thick. Sheaths conspicuously keeled, margins often with long, papillose-based hairs, particularly near the throat; ligules 0.2–1 mm long, truncate, erose; blades 15–40 cm long, 3–7 mm wide, with prominent, white midveins, margins and/or adaxial surfaces often with basal papillose-based hairs. Panicles with 4–10(17) branches, often with 1 branch attached as much as 3 cm below the terminal cluster; branches (3.5)7–16 cm long, 3–5.5 mm wide, linear. Spikelets 4–7 mm long, 2–3 mm wide, with 5–7 florets, obliquely attached to the branch axes; lower glumes 1.1–2.3 mm long, 1-veined; upper glumes 2–2.9 mm long; lemmas 2.4–4 mm long; paleas with narrowly winged keels. Seeds ovoid, rugulose and obliquely striate, usually not exposed at maturity.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Eleusine indica* is a common weed in warmer regions of the world. It usually grows in disturbed areas and lawns and has been found in most states of contiguous Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 40 (US). **Bo-coyna:** Entre barrancas [between canyons] del Cobre & Baca-hipare, 17 Aug 1976, bosque bajo de leguminosas [low legume forest], 1050 m, *S. González & J.M. Peña* 732 (ENCB). **Ocampo:** Parque Nacional "Cascada de Basaseachic," en el area de los divisaderos [in area of divisions], 23 Sep 1990, 2100 m, *R. Corral RCD-3929* (NMC). **Temosachi:** Nabogame, 10 Sep 1987, 1800 m, *Laferr.* 1061 (MEXU).

126. *Eleusine multiflora*\* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 412. 1851.

Annual. Culms 20–30 cm tall, forming dense mats, slender, striate, glabrous or pilose. Sheaths flattened, collar sparsely pubescent with white hairs; ligules 0.8–1 mm long, truncate; blades 10–20 cm long, 3–6 mm wide, sparsely hairy. Inflorescence 2–4 short spikes, alternate, 1–4 cm long, over a winged and toothed rachis. Spikelets 4.5–5 mm long, ovate, with 5–10 florets; glumes 3–4 mm long, laterally compressed, carinate, upper glumes with



FIGURE 93. *Eleusine indica*. A. Habit. B. Spikelet. C. Floret. D. Caryopsis. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

a winged keel; lemma 4.5–5 mm long, wide, laterally compressed, apiculate, with a scabrous keel and membranous margins. Caryopsis 1–1.2 mm long, laterally compressed, deeply sulcate, surface scabrous and densely glandular.

**DISTRIBUTION AND HABITAT.** *Eleusine multiflora* is a common weed in the warmer regions of the world, native of Africa. It usually grows in disturbed areas and lawns and has been found in most states of the contiguous United States to Mexico in Aguascalientes, Chiapas, Chihuahua, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sinaloa, Tlaxcala, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Ejido San Ignacio Arareco, E of Creel, 19 Oct 1973, pine-oak forest, 7300 ft, *Bye* 5477 (MEXU). **Guachochi:** weeds in the plaza at Creel, 14 Oct 1977, *Bye & W.A. Weber* 8134 (MEXU). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, *P.M. Peterson & R.M. King* 8165 (US). **Madera:** Laguna de Babicora alrededores de [around] Nicolas Bravo, 15 Sep 1994, 2150 m, *T. Lebgue, G. Quintana & E. Estrada* 3744 (NMC). **Ocampo:** Cascada de Basaseachic, Río Basaseachic, 5 Sep 2001, 2000 m, *T.R. Vandevender & A.L. Reina* 2001-864 (MEXU-1205781, NMC). **Temosachi:** Nabogme, 10 Sep 1987, 1800 m, *Laferr.* 1056 (MEXU).

### *Elionurus* Humb. & Bonpl. ex Willd.

Perennial, occasionally annual; caespitose, sometimes with short rhizomes. Culms 10–150 cm long, erect, sometimes branching above the base. Leaves sometimes aromatic; sheaths without glandular pits; ligules shortly membranous and densely ciliate or of hairs; blades involute, flat, or folded. Inflorescences terminal, sometimes also axillary, composed of solitary, flexuous rames; rame internodes columnar to clavate, apex strongly oblique, not hollowed or rimmed; disarticulation in the rames, below the sessile spikelets. Spikelets in sessile-pedicellate pairs. Sessile spikelets dorsally compressed; calluses blunt, sometimes resembling a short pedicel; lower glumes enclosing the upper glumes, subcoriaceous, 2-keeled, keels prominently ciliate, intercarinal surface smooth, apex cuspidate to bilobed, rarely entire; lower florets reduced, sterile; upper florets bisexual, unawned; pedicels stout, appressed but not fused to the rame axes, pubescent or ciliate on the angles. Pedicellate spikelets 3–8 mm long, about equal to the sessile spikelets, staminate, muticous to awn-tipped.  $x = 5$ .

*Elionurus* has 15 species. Most species of *Elionurus* are native to tropical Africa and America; one species is Australian. There are two species found in Mexico and in Chihuahua.

### KEY TO SPECIES OF *ELIONURUS*

1. Rhizomes present; culms with nodes and internodes glabrous; racemes sparsely pubescent; lower glumes glabrous . . . . . *E. tripsacoides*
1. Rhizomes absent; culms hirsute to long-pilose beneath the nodes; racemes conspicuously lanose; lower glumes pilose . . . . . *E. barbiculmis*

#### 127. *Elionurus barbiculmis* Hack., Monogr. Phan. 6: 339. 1889.

Plants caespitose. Culms 40–60 cm tall, erect, usually unbranched, densely antrorsely hirsute to long-pilose beneath the nodes. Sheaths mostly glabrous, often ciliate on the margins, particularly at the throat; ligules with 1–2 mm long hairs; blades 15–30 cm long, 1–2(4) mm wide, usually involute, abaxial surfaces with scattered long hairs adjacent to the margins, adaxial surfaces usually densely pilose. Rames 5–10 cm long, internodes densely villous. Sessile spikelets 4.5–8 mm; calluses about 0.5 mm long, hirsute; lower glumes densely hirsute, acuminate, bifid, teeth 1.5–2.5 mm long; pedicels densely pilose dorsally. Pedicellate spikelets with densely pilose lower glumes.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Elionurus barbiculmis* grows on mesas, rocky slopes, hills, and in canyons, usually above 1,200 m. Its range extends from southern Arizona and southwestern Texas into northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bachiniva:** 55 air km NW Cuauhtemoc 6 km S junction to Bachiniva on road to Cuauhtemoc, 30 Oct 1989, 2300 m, *Spellenberg, A. Whittemore, W. Boecklen, M. Mahr, & D. Ward* 10050 (NMC). **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque

de pino-encino [pine-oak forest], 1891 m, *P.M. Peterson & P. Catalán* 17544 (US). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, *P.M. Peterson & J.M. Saarela* 22032 (US). **Casas Grandes:** At first mt range SE Nuevo Casas Grandes, ca 12 mi SE of town on Hwy to Buenaventura, 30 Aug 1986, 2100 m, *Spellenberg & R. Corral* 8580 (NMC). **Chihuahua:** Rancho Experimental La Campana, 23 Oct 1982, pastizal [pastureland], 1640 m, *A. Melgoza* 631 (CIIDIR); km 37–38 carr. [hwy] Chihuahua–Cuauhtémoc, 16 Sep 1997, 1690 m, *E. Estrada & C. Yen* 8574 (NMC); La Campana; Potrero La Sierra, 3 km Pte. carr. Panamericana, 7 Sep 73, pastizal con encinos, 1600 m, *Valdés-Reyna* VR-140 (RELC). **Cuauhtémoc:** km 37–38 carr. Chihuahua–Cuauhtémoc, 16 Sep 1997, 1690 m, *C. Yen & E. Estrada* 8574 (ENCB). **Guachochi:** 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, *P.M. Peterson, Annable & Y. Herrera* 8025 (US); 1–2 km south of Río Osichi and Río Basihuare jct, 1 Sep 2003, bosque de encino-pino, 1600 m, *P.M. Peterson & P. Catalán* 17646 (CIIDIR); W of Munérachi, 7 Sep 2003, matorral xerófilo [xerophilous scrub], 1200 m, *P.M. Peterson & P. Catalán* 17717 (US). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7745 (US); Entre [between] La Junta & Temochi, 12 Aug

1976, pastizal, 2135 m, *M. González & J.M. Peña* 576 (RELC). **Matamoros**: 19.3 km S of Villa Matamoros on Mex 45 to Durango, 3 Oct 1989, 1910 m, *P.M. Peterson & R.M. King* 8257 (US). **San Francisco del Oro**: 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, *P.M. Peterson & Annable* 5958 (ENCB, US).

**128. *Elionurus tripsacoides*** Humb. & Bonpl. ex Willd., Sp. Pl. 4(2): 941. 1806.

Plants caespitose; with short, knotty, rhizomatous bases. Culms 60–120 cm long, glabrous throughout. Sheaths glabrous or pilose on the margins; ligules 0.5–1 mm long, membranous, short ciliate; blades 16–30 cm long, 2–4 mm wide, adaxial surfaces with hairs to 5 mm basally, glabrous distally, margins ciliate near the bases. Rames 6–15 cm long; internodes pilose. Sessile spikelets 6–8 mm long; calluses about 1 mm long, antrorsely hirsute; lower glumes usually mostly glabrous, rarely sparsely pilose dorsally, keels ciliate distally, apex acuminate, bidentate, teeth about 0.5 mm long; pedicels hirsute on the margins, usually glabrous elsewhere. Pedicellate spikelets similar to the sessile spikelets.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Elionurus tripsacoides* grows in moist pine woods and low prairies from southern Texas and the Gulf coast to Georgia, and south through Mexico and Central America to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza**: 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 1990 m, *P.M. Peterson, Annable & Valdés-Reyna* 10747 (CIIDIR, US). **Batopilas**: SW Chihuahua, Aug 1885, *E. Palmer* 22 (US). **Camargo**: E Chihuahua, just E of Organos, Vicinity of Organos, slopes of the igneous Sierra de los Organos, 6 Oct 1941, *R. Stewart & I.M. Johnston* 2058 (US). **Chihuahua**: near Chihuahua, 5 Aug 1885, *C.G. Pringle* 423 (US); La Campana, Potrero La Sierra, 3 km al W de la carr. [hwy] Panamericana, 7 Sep 1973, 1600 m, *Valdés-Reyna* VR-140 (ENCB). **Guachochi**: along Río Corareachi, 30 Aug 2003, slopes with *Quercus*, 1840–1900 m, *P.M. Peterson & P. Catalán* 17604 (CIIDIR, US). **Guerrero**: Entrada [entry] a la Junta & Temochi, 12 Aug 1976, 2135 m, *S. González & J.M.*

*Peña* 571 (ENCB). **Ocampo**: NE of Villa Ocampo near quad. 41, 21 Aug 1948, *Gentry* 8652 (US).

## *Elymus* L.

Perennial; sometimes caespitose, with or without rhizomes, sometimes stoloniferous. Culms usually erect to ascending, sometimes strongly decumbent to prostrate, usually glabrous. Leaves usually evenly distributed, sometimes somewhat basally concentrated; sheaths open for most of their length; auricles often present; ligules membranous, truncate or rounded, sometimes acute, entire or erose, often ciliate; blades abaxial surfaces usually smooth or scabrous, sometimes with hairs, adaxial surfaces scabrous or with hairs, particularly over the veins, usually with unequal, not strongly ribbed, widely spaced veins, sometimes with equal, strongly ribbed, closely spaced veins. Inflorescences spikes, usually exserted, with 1–3(5) spikelets per node; rachises with scaberulous, scabrous, or ciliate edges. Spikelets usually appressed to ascending, sometimes strongly divergent or spreading, with 1–11 florets, the distal florets often reduced, the lowest florets usually functional, sterile and glume-like in some species; disarticulation usually above the glumes and beneath each floret, sometimes also below the glumes or in the rachises; glumes usually 2, absent or highly reduced in some species, usually equal to subequal, sometimes unequal, usually linear-lanceolate to linear, setaceous, or subulate, sometimes oblanceolate to obovate, (0)1- to 7-veined, sometimes keeled over 1 vein, not necessarily the central vein, the keel vein sometimes extended into an awn; lemmas linear-lanceolate, obscurely 5(7)-veined, apex acute, often awned, sometimes bidentate, sometimes with bristles, awns terminal or from the sinus, straight or arcuately divergent, not geniculate; paleas from shorter than to slightly longer than the lemmas, keels scabrous or ciliate, at least in part. Caryopsis with hairy apex.  $x = 7$ .

*Elymus* is a widespread, north-temperate genus of about 241 species (Soreng et al., 2017b). It now includes *Sitanion* Raf., but other taxa previously included in *Elymus* have been moved to *Leymus* and *Thinopyrum* (Barkworth, 2007).

## KEY TO SPECIES OF *ELYMUS*

1. Inflorescence a spike with 2–3 spikelets per node; rachis disarticulating when mature; glumes with excurrent awns, 11–135 mm long, linear to setaceous; lemma awn (10)15–120 mm long; anthers 0.9–3.5 mm long.
  2. Pairs of glumes essentially equal in length, 11–40 mm long, linear-lanceolate to subulate; lemma awn (10)15–40 mm long, moderately to strongly outcurving . . . . . *E. canadensis*
  2. Pairs of glumes mostly unequal in length, 20–135 mm long, linear to setaceous, sometimes highly reduced (as filiform bristles) to absent; lemma awn 15–120 mm long, flexuous to curved near the base . . . . . *E. elymoides*
1. Inflorescence a spike with 1 spikelet per node; rachis continuous, rarely disarticulating when mature; glumes wide or narrow, not elongate and setaceous, lacking excurrent awns; lemma awn absent or up to 40 mm long; anthers 3–7 mm long.
  3. Lemma of the bisexual floret awnless or the awn 2–4(10) mm . . . . . *E. repens*
  3. Lemma of the bisexual floret awned, the awns 1–40 mm long.
    4. Lemma awn straight to flexuous; leaf blades 10–40 mm wide; sometimes weakly rhizomatous or caespitose . . . . .
    4. Lemma awn markedly divergent, recurved; leaf blades 2.5–7 mm wide; plants caespitose, not rhizomatous . . . . .

*E. arizonicus*

129. *Elymus arizonicus* (Scribn. & J. G. Sm.) Gould, Madroño 9(4): 125. 1947. *Agropyron arizonicum* Scribn. & J. G. Sm., Bull. Div. Agrostol. U.S.D.A. 4: 27–28. 1897. *Elytrigia arizonica* (Scribn. & J. G. Sm.) D. R. Dewey, Brittonia 35(1): 31. 1983.

Plants caespitose, not rhizomatous. Culms 45–100 cm tall, erect or decumbent at the base; nodes glabrous or almost so. Leaves evenly distributed over the lower ½ of the culms; sheaths glabrous; auricles usually present, to 1 mm long; ligules to 1 mm long on the basal leaves, 1–3 mm on the flag leaves; blades 2.5–7 mm wide, lax, abaxial surfaces smooth and glabrous, adaxial surfaces scabrous, with scattered 0.5–1 mm hairs, veins close together. Spikes 12–25 cm long, 2.5–6 cm wide including the awns, 10–15 mm wide excluding the awns, flexuous, usually nodding or pendent at maturity, with 1 spikelet per node; internodes 11–17 mm long, 0.4–1 mm wide, glabrous, mostly smooth, scabrous on the edges. Spikelets 14–26 mm long, 6–8 mm wide, appressed to divergent, 1.5–2 times as long as the internodes, with 4–6 florets; rachillas glabrous; disarticulation above the glumes and beneath each floret; glumes narrowly lanceolate, margins about 0.2 mm wide, 3(5)-veined, the bases flat, evidently veined, margins hyaline, widest at about midlength, acute or acuminate, unawned or awned, awns to 4 mm long, straight; lower glumes 5–9 mm long, upper glumes 8–10 mm long; lemmas 8–15 mm long, scabrous, rounded on the back, awns 10–25 mm long, arcuately diverging; paleas as long as or longer than the lemmas, tapering, apex truncate, about 0.3 mm wide; anthers 3–5 mm long.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Elymus arizonicus* grows in moist, rocky soil in mountain canyons of the southwestern United States and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7711 (US). **Casas Grandes:** 3 mi S of Cuesta Blanca, W of Casas Grandes, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3536 (ARIZ); 3537 (MEXU, US); Cool ledges, Sierra Madre, 8 Oct 1887, 9000 ft, *C.G. Pringle* 1439 (US, MEXU). **Chihuahua:** Canyon de St. Diego, 17 Sep 1891, *C.V. Hartman* 805 (US); Santa Clara Canyon, 18 Aug 1936, *LeSueur* 0173 (MEXU). **Galeana:** Río Galeana, 12 Aug 1982, Vegetación Riparia [riparian vegetation], 1460 m, *Ing. Enríquez* 1862 (MEXU). **Gómez Farías:** Laguna de Babicora, Cerro Canoas, 3 Sep 1994, 2400 m, *T. Lebgue, G. Quintana & E. Estrada* 2931 (NMC). **Guadalupe y Calvo:** about 3 mi S of La Rocha, Sierra Mohinora, on bluffs along stream (tributary of Río del Soldado), 18 Oct 1959, 7000 ft, *Correll & Gentry* 23232 (ENCB); near Cumbre Mohinora, 13 Sep 2006, 3300 m, *P.M. Peterson* 20041, *F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Madera:** Ciénega Ojo de la Vibora, ejido El Largo, 14 Oct 1990, bosque de pino [pine forest], 2300 m, *O. Bravo* 1904 (CIIDIR); *A. Benítez* 2865 (CIIDIR, MEXU); Sierra Madre near Col. García, 19 Sep 1899, bosque de encino [oak forest], 2300 m, *C.H.T. Townsend & C.M. Barben* 337 (US); Chuichupa, Aug 1936, *LeSueur* 0115 (US); Puerto del Tenedor, ejido El Largo, 21 Aug 1990, bosque de pino, 2450 m, *O. Bravo* 1208 (CIIDIR); Laguna de Babicora, 4 km al N del Ejido La Raíz, 10 Sep 1994, *G. Quintana & E. Estrada* 3657 (NMC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,”

at base falls, 26 Abr [Apr] 1985, 1600 m, *Spellenberg, R. Soreng & R. Corral* 8013 (MEXU, NMC); Parque Nacional “Cascada de Basaseachic,” in canyon along Río Candamena leading to falls, 4 Oct 1986, 2000 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8781 (NMC).

130. *Elymus canadensis* L., Sp. Pl. 1: 83–84. 1753.

Plants loosely caespitose, rarely with rhizomes of 1–2 mm thick, often glaucous. Culms (40)60–150(180) cm tall, erect or decumbent; nodes 4–10, mostly concealed by the sheaths, glabrous. Sheaths smooth or scaberulous, glabrous or hirsute, often reddish brown; auricles 1.5–4 mm long, brown or purplish black; ligules to 1(2) mm long, truncate, ciliate; blades (3)4–15(20) mm wide, usually firm, often ascending and somewhat involute, usually dull green, drying to grayish. Spikes 6–30 cm long, 3–7 cm wide, usually nodding, sometimes pendent or almost erect, usually with 2(3) spikelets per node, occasionally to 5 at some nodes, rarely with 1 at some nodes but never throughout; internodes (2)3–5(7) mm long, or 5–10 mm long toward the base, 0.2–0.35 mm thick at the thinnest sections, glabrous or with a few hairs below the spikelets. Spikelets 12–20 mm long excluding the awns, more or less divergent, with (2)3–5(7) florets, lowest florets functional; disarticulation usually above the glumes and beneath each floret, rarely also below the glumes; glumes usually equal, occasionally subequal, 11–40 mm long including the awns, the basal 0–1 mm subterete and slightly indurate, glume bodies 6–13 mm long, 0.5–1.6 mm wide, linear-lanceolate to subsetaceous, entire, widening or parallel-sided above the base, 3- to 5-veined, glabrous to scabrous-ciliate, rarely villous on the veins, margins firm, awns (5)10–25(27) mm long, straight to outcurving; lemmas 8–15 mm long, glabrous, scabrous, hispid, or uniformly villous with the hairs generally appressed, awns (10)15–40 mm long, moderately to strongly outcurving, often contorted at the spike bases; paleas 7–13 mm long, acute, usually bidentate; anthers 2–3.5 mm long.  $2n = 28$ , rarely 42.

**DISTRIBUTION AND HABITAT.** *Elymus canadensis* grows on dry to moist or damp, often sandy or gravelly soil on prairies, dunes, stream banks, ditches, roadsides, and disturbed ground or, especially to the south, in thickets and open woods near streams. It is widespread in most of temperate North America, extending from the southwestern Northwest Territories to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Camargo:** 5 km W of Cd. Camargo, 5 Aug 1939, 1220 m, *L. H. Harvey* 1406 (ENCB). **Chihuahua:** Valley near Chihuahua, 20 Sep 1885, *C.G. Pringle* 505 (MEXU, US); 14 Oct 1910, *Hitchcock* 7771 (US).

131. *Elymus elymoides* (Raf.) Swezey, Doane Coll. Nat. Hist. Stud. 1: 155. 1891. *Sitanion elymoides* Raf., J. Phys. Chim. Hist. Nat. Arts 89: 103. 1819.

FIGURE 94

Plants caespitose, often glaucous, not rhizomatous. Culms 8–65(77) cm tall, erect or geniculate to slightly decumbent,



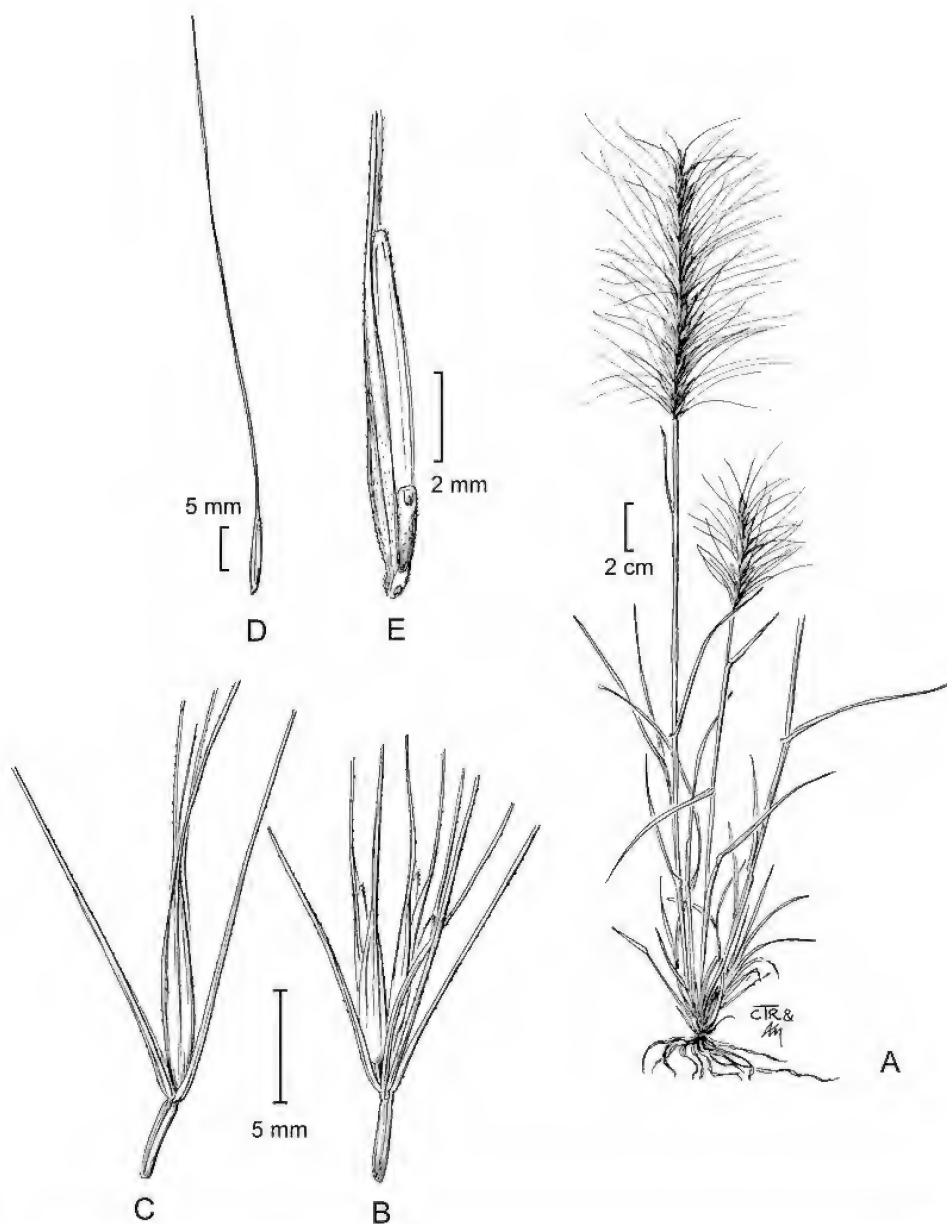


FIGURE 94. *Elymus elymoides* subsp. *brevifolius*. A. Habit. B. Two spikelets. C. Spikelet. D. Lower floret. E. Lower floret, magnified. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

sometimes puberulent; nodes 4–6, mostly concealed, usually glabrous, sometimes pubescent. Leaves evenly distributed; sheaths glabrous, scabrous, puberulent, or densely white-villous; auricles usually present, to about 1 mm long, often purplish; ligules shorter than 1 mm long, truncate, entire or lacerate; blades (1)2–4(6) mm wide, spreading or ascending, often involute, sometimes folded, abaxial surfaces glabrous to puberulent, adaxial surfaces

scabrous, puberulent, hirsute, or white-villous. Spikes 3–20 cm long, 5–15 cm wide, erect to subflexuous, with 2–3 spikelets per node, rarely with 1 at some nodes; internodes 3–10(15) mm long, 0.1–0.4 mm thick at the thinnest sections, usually glabrous, sometimes puberulent beneath the spikelets. Spikelets 10–20 mm long, divergent, sometimes glaucous, at least 1 spikelet at a node with 2–4(5) florets, 1–4(5) florets fertile, sometimes all florets

sterile in the lateral spikelets; disarticulation initially at the rachis nodes, subsequently beneath each floret; glumes subequal, 20–135 mm including the often undifferentiated awns, the bases indurate and glabrous, glume bodies 5–10 mm long, 1–3 mm wide, linear to subulate and setaceous, sometimes highly reduced (as filiform bristles) to absent, 1- to 3-veined, margins firm, awns 15–125 mm long, scabrous, sometimes split into 2–3 unequal divisions, flexuous to outcurving from near the base at maturity; fertile lemmas 6–12 mm long, glabrous, scabrous, or appressed-pubescent, 2 lateral veins excurrent into bristles to 10 mm long, awns 15–120 mm long, about 0.4 mm wide at the base, often reddish or purplish, scabrous, flexuous to curved near the base; paleas 6–11 mm long, veins often excurrent into bristles to 2(5) mm long, apex acute to truncate; anthers 0.9–2.2 mm long. Anthesis from late May to July.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Elymus elymoides* grows in dry, often rocky, open woods, thickets, grasslands, and disturbed areas. It is widespread in western North America, from British Columbia to northern Mexico. It comprises four subspecies; only *Elymus elymoides* subsp. *brevifolius* (J. G. Sm.) Barkworth is in Mexico (Chihuahua).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** weeds in the plaza at Creel, 14 Oct 1977, maleza [meadow], 2200 m, *Bye & W.A. Weber 8138* (MEXU). **Carichi:** Carichi, 23 Sep 1982, pastizal [pastureland], 2200 m, *Blanco 1897* (MEXU). **Casas Grandes:** Just S of Hernández, W of Casas Grandes, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom 3529* (ARIZ); W of Casas Grandes just south of Hernández, 18 Sep 1960, region pine-oak, 6800 m, *Reeder, C. Reeder & Soderstrom 3534* (MEXU). **Chihuahua:** Chihuahua, Aug.–Sept 1936, *LeSueur 088* (MEXU); Sierra de la Parra across Rio Grande from Sierra Vieja, 13 Jun 1973, bosque juniperus-pino [juniper-pine forest], 1450–2158 m, *M.C. Johnston, T.L. Wendt & F. Chiang 11307* (MEXU). **Janos:** Rancho Santa Anita, 12 Jun 1979, pastizal halófito [halophyte grassland], 1600 m, *Blanco 91* (MEXU). **Madera:** Laguna de Babicora, alrededores [surroundings] de Nicolas Bravo, 18 Aug 1994, 2200 m, *Quintana, Lebgue & Estrada 3130* (NMC); 12 km adelante [ahead] del Paraje Ojo de la Víbora, ejido El LAug, 26 Jun 1990, bosque de pino-encino [oak], 2000 m, *A. Benítez 1437* (MEXU); Paraje El 8, junto [next to] al arroyo del ocho, ejido El LAug, 2 May 1992, bosque [grove] de *Populus tremuloides*, 2400 m, *E. Guízar 2641* (MEXU). **Ocampo:** Parque Nacional de la Cascada de Basaseachic, 26 Abr [Apr] 1985, *Spellenberg et al 8057* (MEXU). **Temosachi:** Nabogame, 23 May 1987, riverbank, 1800 m, *Laferr. 497* (MEXU).

132. *Elymus repens*\* (L.) Gould, Madroño 9(4): 127. 1947. *Triticum repens* L., Sp. Pl. 1: 86. 1753.

Plants strongly rhizomatous, sometimes glaucous. Culms 50–100 cm tall. Leaves sometimes basally concentrated; sheaths pilose or glabrous proximally; auricles 0.3–1 mm; ligules 0.25–1.5 mm; blades 6–10 mm wide, usually flat, glabrous abaxially or sparsely pilose, adaxial surfaces usually sparsely pilose over the veins, sometimes glabrous, veins smooth, widely spaced,

primary veins prominent, separated by the secondary veins. Spikes 5–15 cm long, 0.5–1.5 cm wide, erect, usually with 1 spikelet per node, occasionally with 2 at a few nodes; internodes 4–6(9.5) mm long, 0.5–1.2 mm wide, smooth or scabrous, glabrous, evenly puberulent, or sparsely pilose, hairs to 0.3 mm. Spikelets 10–27 mm long, appressed to ascending, with 4–7 florets; disarticulation tardy, usually below the glumes, the spikelets falling intact; glumes oblong, glabrous, keeled distally, keels inconspicuous and smooth proximally, scabrous and conspicuous distally, lateral veins inconspicuous, hyaline margins present in the distal ½, apex acute, unawned or awned, awns to 3 mm; lower glumes 8.8–11.4 mm long, 3- to 6-veined; upper glumes 7–12 mm long, 5- to 7-veined; lemmas 8–12 mm long, glabrous, mostly smooth, sometimes scabrous distally, unawned or with a 0.2–4(10) mm awn, awns straight; paleas 7–9.5 mm long, keels ciliate from ½ to almost the entire length, apex emarginate, truncate, or rounded; anthers 4–7 mm long.  $2n = 22, 42$ .

**DISTRIBUTION AND HABITAT.** *Elymus repens* grows well in disturbed sites, spreading rapidly via elongate rhizomes as well as by seed. It is native to Eurasia and established through much of the North America, extending from Alaska to Greenland and south to California, Texas, and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Sierra Madre, 18 Oct 1887, *C.G. Pringle 1176* (MEXU). **Bocoyna:** Along old road W of Sisoguichic: pine-oak forest region, 12 Aug 1971, *Bye 1842* (MEXU). **Casas Grandes:** 5 mi S of Hernández, W of Casas Grandes, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom 3517* (ARIZ); 3525 (MEXU, US). **Cuauhtémoc:** 12 mi W of Cuauhtémoc, 5 Sep 1967, *Reeder & C. Reeder 4884* (ARIZ); 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable 9601* (US). **Gómez Farías:** Laguna de Babicora, 18 Aug 1994, 2150 m, *T. Lebgue & E. Estrada 3306* (NMC). **Guachochic:** Near Cusarare S of Arroyo Cusarare vado, 11 Aug 1972, pine-oak-juniper forest, 6900 ft, *Bye 2734* (MEXU). **Ocampo:** Parque Nacional Cascada Basaseachic, ca. 100 m upstream from the top of the falls along río Basaseachic, 1 Aug 1988, grassland, 2000 m, *Spellenberg, R. Corral, J. Brunt & L. Huenneke 9607* (CIIDIR, MEXU); Near Mirador of Cascada Basaseachic, 2022 m, slopes with *Pinus*, 7 Sep 2008, *P.M. Peterson & J.M. Saarela 22093* (US).

133. *Elymus trachycaulus* (Link) Gould ex Shinnars, Rhodora 56(663): 28. 1954.

FIGURE 95

Plants caespitose, sometimes weakly rhizomatous. Culms 30–150 cm tall, ascending to erect; nodes usually glabrous. Leaves basally concentrated; sheaths usually glabrous, sometimes markedly retrorsely hirsute or villous; auricles absent or to 1 mm; ligules 0.2–0.8 mm long, truncate; blades 2–5(8) mm wide, flat to involute, usually straight and ascending, abaxial surfaces usually smooth and glabrous, sometimes hairy, adaxial surfaces usually glabrous, sometimes conspicuously hairy. Spikes 4–25 cm long, 0.4–1 cm wide, erect, with 1 spikelet at all or most

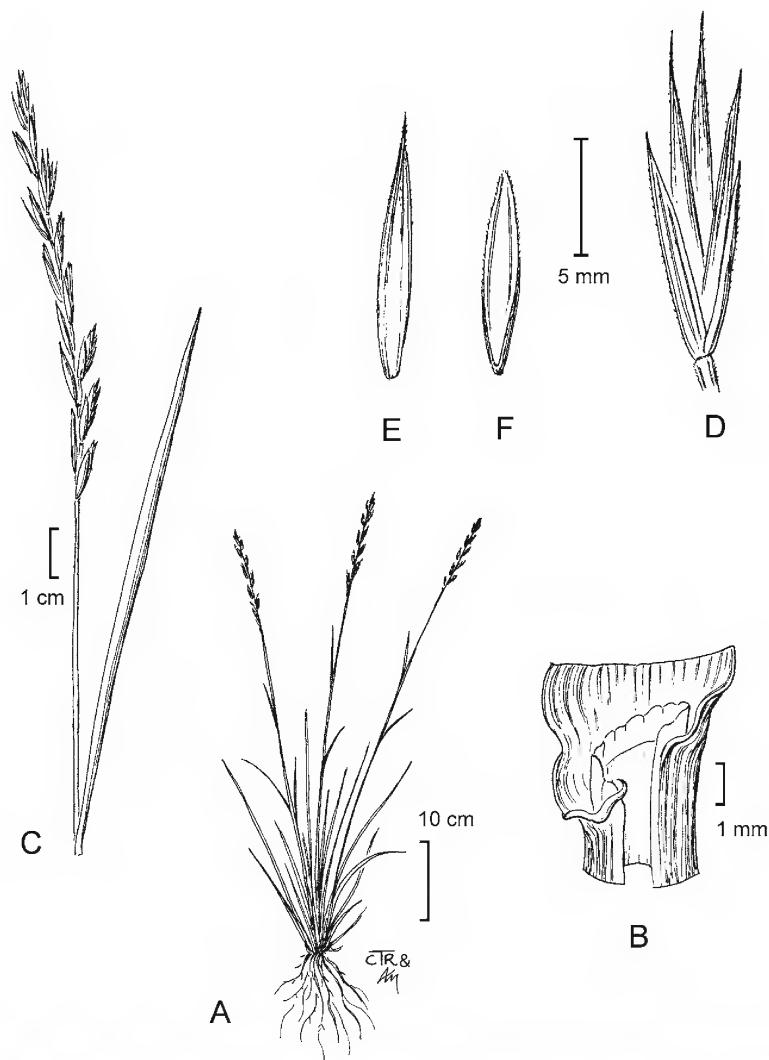


FIGURE 95. *Elymus trachycaulus*. A. Habit. B. Ligule. C. Inflorescence. D. Spikelet. E. Lemma. F. Palea. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

nodes; internodes (4)7–9(12) mm long, edges scabrous, both surfaces smooth and glabrous. Spikelets 9–17(20) mm long, usually at least twice as long as the internodes, 3–6 mm wide, appressed, with 3–9 florets, lowest florets functional; rachillas glabrous or hairy, hairs to 0.3 mm; disarticulation above the glumes, beneath each floret; glumes subequal, 5–17 mm long, from  $\frac{3}{4}$  as long as to longer than the adjacent lemmas, 1.8–2.3 mm wide, lanceolate to narrowly ovate, widest about midlength, usually green, purple at higher latitudes and elevations, flat or asymmetrically keeled for their full length, 3- to 7-veined, the keel vein usually scabrous, the others smooth or scabrous, only 1 vein excurrent

to the apex, adaxial surfaces glabrous, margins hyaline or scarios, usually more or less equal, 0.2–0.5 mm wide, widest at or slightly beyond midlength, apex acute to awned, awns to 11 mm long; lemmas 6–13 mm long, glabrous, usually smooth proximally, often scaberulous distally over the veins, apex acute, usually awned, awns to 40 mm long, usually straight, sometimes weakly curved if shorter than 10 mm; paleas subequal to the lemmas, keels straight or slightly outwardly curved below the apex, tapering to the apex, apex truncate, 0.15–0.3 mm wide, keel veins often excurrent beyond the intercostal region, sometimes forming teeth; anthers (0.8)1.2–2.5(3) mm long.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Elymus trachycaulus* grows from sea level to 3,300 m, usually in open or moderately open areas and sometimes in forests. Its range extends from the boreal forests of North America east through Canada to Greenland and south into Mexico. It has two varieties in Mexico; only *Elymus trachycaulus* var. *trachycaulus* is found in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** Approx. 22.5 mi NE of Cieneguita de Barranca on road towards Creel, 5 Sep 2003, bosque de pino [pine forest], 2160 m, P.M. Peterson & P. Catalán 17690 (US). **Madera:** Sierra Madre near Col. García, 14 Sep 1899, bosque de encino [oak forest], 2300 m, C.H.T. Townsend & C.M. Barben 328 (US); Chuichupa, 22 Aug 1937, LeSueur 0201 (US). **Ocampo:** Parque Nacional "Cascada de Basaseachic," 100 m upstream from the top of the falls along the Rio Basaseachi, 1 Aug 1988, 2000 m, Spellenberg, R. Corral, J. Brunt & L. Huenneke 9607 (NMC). Riva Palacio: Majalca, 26 Jul 1936, LeSueur 0139 (MEXU); 13 Aug 1939, L. H. Harvey 1489 (US).

### ***Enneapogon* Desv. ex P. Beauv.**

Perennial or annual; caespitose, more or less hairy throughout. Culms 3–100 cm tall; nodes hairy; internodes hollow. Sheaths open; ligules of hairs; microhairs of blades each with an elongated basal cell and an inflated terminal cell. Inflorescences terminal, spike-like to somewhat open panicles, bases often included within the uppermost leaf sheath; disarticulation above the glumes but not between the florets, florets falling as a unit. Spikelets with 3–6 florets, frequently only the lowest floret bisexual, distal florets progressively reduced. Glumes subequal, as long as or slightly shorter than the florets (including the awns), more or less pubescent; lower glumes 5- to 7-veined; lemmas firm, rounded on the backs, villous below the middle, strongly 9-veined, veins excurrent into equal, plumose awns 3–5 times as long as the lemma bodies and forming a pappus-like crown; paleas longer than the lemmas, entire, thinly membranous, 2-veined, 2-keeled, keels hairy; anthers 0.2–1.5 mm long, 3; styles 2, free to the base, white.  $\times = 10$ . *Enneapogon* includes about 24 species. It is found in tropical and warm regions of the world, especially in Africa and Australia.

134. *Enneapogon desvauxii* P. Beauv., Ess. Agrostogr. 82, 161. t. 16, f. 11. 1812.

FIGURE 96

Perennial. Culms 20–45 cm tall, about 1 mm thick, ascending to erect from a hard knotty base, often branching; nodes pubescent. Sheaths usually shorter than the internodes, more or less pubescent; ligules about 0.5 mm long; blades mostly 2–12 cm long, 1–2 mm wide, more or less hairy, soon involute. Panicles 2–10 cm long, spike-like, grayish-green or lead-colored. Spikelets mostly 5–7 mm long, usually only the lowest floret bisexual; glumes subequal, 3–5 mm long, thin, puberulent; upper



FIGURE 96. *Enneapogon desvauxii*. A. Habit. B. Spikelet. C. Floret. D. Cleistogamous spikelet. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

glumes often 3- to 4-veined; lowest lemmas 1.5–2 mm long, firm, rounded on the back; awns 3–4 mm long; anthers 0.3–0.5 mm long. Caryopsis 1–1.2 mm long, oval, plump; embryos subequal to the caryopsis. Cleistogamous spikelets commonly present in the lower sheaths, their lemmas larger than those of the florets in the aerial panicles, unawned or with awns that are much reduced.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Enneapogon desvauxii* grows in open areas of the southwestern United States and in much of Mexico. It also grows in Peru, Bolivia, Argentina, and most of Africa, extending eastward through Saudi Arabia and India to China.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 12 km al N de Flores Magón, 7 Oct 1995, 1180 m, R. Corral, P. Olivas & J.O. Torres RCD6485 (UACJ); 5 km al N de Flores Magón, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5377 (UACJ); 10 km al norte de Estación Sueco, 10 Oct 74, matorral [scrub], 1400 m, Valdés-Reyna VR-643 (RELC). **Aldama:** 10.9 (rd) mi NE of Aldama along Chihuahua Hwy 16, 14 Sep 1972, matorral, 4200 ft, J. Henrickson 7502 (MEXU); km 50 carr. [hwy] Chihuahua–Ojinaga, 24 Aug 1978, matorral, 1250 m, Rodríguez, Molinar & Baray 278 (MEXU); 24, Aug 1978, matorral, 1250 m, Rodríguez, Molinar & Baray 20 (MEXU). **Aquiles Serdan:** Aquiles Serdán km 2 camino [road] a San Diego de Alcalá, 29 Sep 1995, matorral, 1260 m, Ing. González 99 (MEXU). **Camargo:** 6 mi W of Piloncillo, rd from Jimenez to Camargo, 24 Sep 1938, I.M. Johnston 7876 (US). 17 mi SSE of Camargo, 6 Sep 1967, 4200 ft, Reeder & C. Reeder 4869 (ARIZ, ENCB); km 2 carr. Camargo–Chihuahua, 29 Sep 1995, orilla de camino [wayside], 1240 m, Ing. González 86 (MEXU). **Casas Grandes:** Arroyo Los Nogales, 20 km al S de Col. Juárez, 23 Sep 1982, 1450 m, pastizal en barranca [pastureland in canyon], Tenorio 1602 & Romero (ENCB, MEXU). **Chihuahua:** Chihuahua, 14 Oct 1910, Hitchcock 7801 (US); near Chihuahua, 4 Sep 1885, C.G. Pringle 483 (MEXU, US); 20 Aug 1935, LeSueur Mex-045 (US); 5 mi SW of Chihuahua on rd to Cuauhtémoc, 6 Oct 1959, Soderstrom 903 (MEXU, US), 922 (MEXU, US); 12 mi N of Chihuahua, 16 Sep 1960, grassland, 1500 m, Reeder, C. Reeder & Soderstrom 3483 (ENCB, US); 17 km al Oeste [W] de Chihuahua, carr. Chihuahua–Cuauhtémoc, 11 Aug 1996, 1500 m, E. Estrada & C. Yen 5219 (NMC); La Campana, Potrero El Plan, 22 Sep 74, pastizal mediano abierto [mostly open grassland], 1500 m, Valdés-Reyna VR-625 (RELC); carr. Chih–Delicias km 18 entronque [junction] a Mapula, 29 Sep 1995, pastizal, 1520 m, Quiñones 105, 111 (MEXU). **Delicias:** 7 mi S of Delicias along Hwy 45, 24 Sep 1972, matorral, 4000 ft, J. Henrickson 7993 (MEXU). **Hidalgo del Parral:** 2 mi E of Parral, 3 Oct 1959, Soderstrom 860 (US); NE edge of Parral, 30 Sep 1959, D.S. Correl 22670 (ENCB). **Jiménez:** Reserva de la Biosfera de Mapimí, dunas de arena [sand dunes] La Soledad, 9 Jul 1997, matorral xerófilo [xerophilous scrub], 1140 m, A. García 2702 (CIIDIR); 20 Sep 1999, A. García 3689 (CIIDIR); 8 mi NW of Jiménez on Mex. 45, 30 Ag 1971?, 4400 ft, L. H. Harvey 8890 (ENCB); Bank of Rio Florido, Cd. Jiménez, 28 Jul 1939, 1340 m, L. H. Harvey 1329

(ENCB); 33 mi SE of Jiménez, 27 Sep 1963, Reeder & C. Reeder 3618 (ARIZ); 9 km NW of Las Pampas ranch, on the road to Camargo, at the main ranch gate, 24 Aug 1972, matorral, 1450 m, F. Chiang, T. Wendt & M.C. Johnston 8818 (MEXU). **Juárez:** parte alta [high part] de la Sierra de Samalayuca, aprox. 50 km al S de Cd. Juárez, 9 Sep 1995, 1300 m, R. Corral & P. Olivas RCD6365 (UACJ); Sierra de Samalayuca, 13 Oct 1997, pastizal, I. Enríquez, S. Ordoñez & J. Leyva IEA16 (UACJ). **Manuel Benavides:** E Chihuahua, vicinity of Pirámide, 11 Aug 1941, I.M. Johnston 8116 (US). **Meoqui:** Entre [between] Julimes & Felipe Ángeles, 31 Jul 76, matorral, 1330 m, S. González & J.M. Peña 394 (RELC). **Nuevo Casas Grandes:** 27.4 km S of Nuevo Casa Grandes on MEX 2, 28 Sep 1989, oak woods, 1585 m, P.M. Peterson & R.M. King 8146 (ENCB). **Ojinaga:** 43 km W of Ojinaga on Hwy to Chihuahua city, about 2 km N of the deeply incised canyon of Río Conchos, 20 Oct 1972, matorral, 950 m, T.L. Wendt, F. Chiang & M.C. Johnston 9734 (MEXU); Mina Las Marías on Mesa de Aguila, 5 Oct 1972, matorral, 900 m, F. Chiang, T. Wendt & M.C. Johnston 9685 (MEXU). **Saucillo:** Rancho El Salvador, 10 Oct 1995, matorral, 1300 m, Fierros 113 (MEXU). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, P.M. Peterson & Annable 8098 (ENCB, US).

### *Eragrostis* Wolf

Annual or perennial; usually synoecious, sometimes dioecious; caespitose, stoloniferous, or rhizomatous. Flowering culms not woody, erect, decumbent, or geniculate, sometimes rooting at the lower nodes, simple (without innovations or sprouts at the lower nodes) or branched (with innovations or sprouts at the lower nodes); internodes solid or hollow. Sheaths open, often with tufts of hairs at the apex; ligules usually membranous and ciliate or ciliate, cilia sometimes longer than the membranous base, occasionally of hairs or membranous and non-ciliate; blades flat, folded, or involute. Inflorescences terminal, sometimes also axillary, simple panicles, open to contracted or spike-like, terminal panicles usually exceeding the upper leaves; pulvini in the axils of the primary branches glabrous or hairy; branches not spike-like, not disarticulating, laterally compressed, with 2–45 florets; disarticulation below the fertile florets, sometimes also below the glumes. Glumes usually shorter than the adjacent lemmas, (1)3(5)-veined, not lobed, apex obtuse to acute, awnless; calluses glabrous or sparsely pubescent; lemmas usually glabrous, obtuse to acute, 3(5)-veined, usually keeled, awnless or mucronate; paleas shorter than the lemmas, longitudinally bowed-out by the caryopsis, 2-keeled, keels usually ciliate; anthers 2 or 3; ovaries glabrous. Cleistogamous spikelets occasionally present, sometimes on the axillary or on terminal panicles. Caryopsis variously shaped.  $x = 10$ .

*Eragrostis*, a genus of approximately 444 species, occurs in tropical and subtropical regions throughout the world (Soreng et al., 2017b). There are 18 species of *Eragrostis* in Chihuahua and, of these, 10 are native (Peterson, 2003a; Peterson and Valdés Reyna, 2005).



KEY TO SPECIES OF *ERAGROSTIS*

1. Annual, caespitose or mat-forming, without innovations at the basal nodes.
  2. Palea keels prominently ciliate, the cilia 0.2–0.8 mm long.
    3. Spikelets 1.8–3.2 mm long, 1–2 mm wide, with 6–11 florets; lemmas 0.8–1.3 mm long without glands on the keels; anthers 2 ..... *E. ciliaris*
    3. Spikelets 6–20 mm long, 2–4 mm wide, with 10–40 florets; lemmas 2–2.8 mm long with 1–3 crateriform glands on the keels; anthers 3 ..... *E. cilianensis*
  2. Palea keels smooth or scabrous, the cilia less than 0.2 mm long.
    4. Caryopsis with a shallow or deep ventral groove, ovoid to straight angular-prismatic, the surface striate ..... *E. mexicana*
    4. Caryopsis without a ventral groove, usually globose, pyriform, ovoid to prism-shaped, or ellipsoid, the surface smooth to faintly striate.
      5. Plants without glandular pits or bands.
        6. Lower glumes 0.5–1.5 mm long, at least ½ as long as the lowest lemmas; spikelets 1.2–2.5 mm wide; panicle branches solitary or paired at the lowest 2 nodes; lemmas with moderately conspicuous lateral veins ..... *E. pectinacea*
        6. Lower glumes 0.3–0.6(0.8) mm long, usually less than ½ as long as the lowest lemmas; spikelets 0.6–1.4 mm wide; panicle branches usually whorled at the lowest 2 nodes; lemmas within conspicuous lateral veins ..... *E. pilosa*
      5. Plants with glandular pits or bands somewhere, the location(s) various, including any or all of the following: below the cauline nodes, on the sheaths, blades, rachises, panicle branches, or pedicels, or on the keels of the lemmas.
        7. Spikelets 0.6–1.4 mm wide; pedicels 1–10 mm long, lax, appressed or divergent ..... *E. pilosa*
        7. Spikelets 1.1–4 mm wide; pedicels 0.2–4 mm long, stiff, straight, usually divergent.
          8. Lemmas 1–1.4 mm long; spikelets with 2–3(5) florets; pedicels with a glandular ring or band; lower glumes 0.5–0.8 mm long; sheaths with papillose-hirsute hairs on the collar ..... *E. pringlei*
          8. Lemmas 1.4–2.8 mm long; spikelets with 7–40 florets; pedicels without a glandular ring or band; lower glumes 0.9–2 mm long; sheaths without papillose-hirsute hairs on the collar
            9. Lemmas 2–2.8 mm long, with 1–3 crateriform glands along the keels; spikelets 6–20 mm long, 2–4 mm wide, with 10–40 florets; disarticulation below the florets, the rachillas persistent; anthers yellow ..... *E. cilianensis*
            9. Lemmas 1.4–1.8 mm long, without crateriform glands along the keels; spikelets 4–7(11) mm long, 1.1–2.2 mm wide, with 7–12(20) florets; disarticulation below the lemmas, both the paleas and rachillas usually persistent; anthers reddish-brown ..... *E. barleri*
  1. Perennial, sometimes rhizomatous, forming innovations at the basal nodes.
    10. Paleas with a broad lower portion forming a wing or tooth on each side, these often projecting beyond the lemmas.
      11. Spikelets 5.5–16 mm long, 2.7–9 mm wide; lemmas 3–5 mm long, the keels without crateriform glands; pedicels with a narrow band or abscission line just below the apex; anthers 1.4–2.8 mm long ..... *E. superba*
      11. Spikelets 2–5 mm long, 2–3.5 mm wide; lemmas 1.8–2.3 mm long, the keels with a few crateriform glands; pedicels without a narrow band or abscission line just below the apex; anthers 0.5–0.9 mm long ..... *E. echinochloidea*
    10. Paleas without a broad lower portion forming a wing or tooth, the bases never projecting beyond the lemmas.
      12. Plants with short, knotty rhizomes less than 4 mm thick, often stout but never elongated ..... *E. spectabilis*
      12. Plants not rhizomatous
        13. Caryopsis with shallowly to deeply grooved adaxial surfaces, straight angular-prismatic to ellipsoid, ovoid, or obovoid in overall shape.
          14. Caryopsis strongly dorsally compressed, translucent, mostly light brown, bases sometimes greenish.
            15. Lemmas 1.8–3 mm long; panicles 16–35(40) cm long, (4)8–24 cm wide; blades 12–50(65) cm long; caryopsis 1–1.7 mm long; ligules 0.6–1.3 mm long ..... *E. curvula*
            15. Lemmas 1.5–1.7 long; panicles 7–18 cm long, 2–8 cm wide; blades 2–12 cm long; caryopsis 0.6–0.8 mm long; ligules 0.3–0.5 mm long ..... *E. lehmanniana*
          14. Caryopsis laterally compressed, terete, or slightly dorsally compressed, usually opaque and reddish-brown.
            16. Lemmas 1.2–1.6 mm long; culms (20)30–50(60) cm tall; sheaths usually glabrous ..... *E. lugens*
            16. Lemmas 1.6–3 mm long; culms (30)40–170 cm tall; sheaths usually hairy.
              17. Lemmas 1.6–2.2 mm long; anthers 0.5–0.8 mm long, purplish ..... *E. intermedia*
              17. Lemmas 2–3 mm long; anthers 0.6–1.7 mm long, purplish to yellowish.

18. Caryopsis 0.8–1.6 mm long; lemmas 2.4–3 mm long ..... *E. erosa*  
 18. Caryopsis 0.6–0.8 mm long; lemmas 2–2.6 mm long ..... *E. palmeri*  
 13. Caryopsis not grooved on the adaxial surfaces, ellipsoid, ovoid, obovoid, globose, to pyriform, prism-shaped, and straight angular-prismatic in overall shape.  
 19. Anthers 2; primary branches stiff; panicles 1–15 cm wide, narrowly oblong to ovate and open; pedicels 0–1(3) mm long, always shorter than the spikelets; spikelets 2.4–5 mm wide ..... *E. secundiflora*  
 19. Anthers 3.  
 20. Primary panicle branches not rebranched; proximal spikelets on each branch sessile or subsessile, the pedicels shorter than 0.4 mm ..... *E. sessilisipica*  
 20. Primary panicle branches with secondary branches; proximal spikelets on each branch pedicellate, the pedicels longer than 0.4 mm.  
 21. Spikelets 2–5.5 mm long; lemmas 1.2–1.6 mm long; culms (20)30–50(60) cm tall ..... *E. lugens*  
 21. Spikelets 4–12 (14) mm long; lemmas 1.5–3 mm long; culms (20) 40–150 cm tall.  
 22. Lemmas 1.8–3 mm long; panicles 16–35(40) cm long, (4)8–24 cm wide; blades 12–50(65) cm long; caryopsis 1–1.7 mm long; ligules 0.6–1.3 mm long ..... *E. curvula*  
 22. Lemmas 1.5–1.7 long; panicles 7–18 cm long, 2–8 cm wide; blades 2–12 cm long; caryopsis 0.6–0.8 mm long; ligules 0.3–0.5 mm long ..... *E. lehmanniana*

135. *Eragrostis barrelieri*\* Daveau, J. Bot. (Morot) 8: 289. 1894.

FIGURE 97

Caespitose annual; without innovations. Culms (5)10–60 cm tall, erect to decumbent and prostrate, much-branched near the base, somewhat glaucous, with a ring of glandular tissue below the nodes, rings often shiny or yellowish. Sheaths  $\frac{1}{2}$ – $\frac{7}{8}$  the length of the internodes, hairy at the apex, hairs to 4 mm long; ligules 0.2–0.5 mm long, ciliate; blades 1.5–10 cm long, 1–3(5) mm wide, flat, abaxial surfaces glabrous, adaxial surfaces glabrous, sometimes scaberulous, occasionally with white hairs to 3 mm long, margins without crateriform glands. Panicles 4–20 cm long, 2.2–8(10) cm wide, ovate, open to contracted, rachises with shiny or yellowish glandular spots or rings below the nodes; primary branches 0.5–6 cm long, diverging 20°–100° from the rachises; pulvini glabrous; pedicels 1–4 mm long, stout, stiff, divergent, without glandular bands. Spikelets 4–7(11) mm long, 1.1–2.2 mm wide, narrowly ovate, reddish-purple to greenish, occasionally grayish, with 7–12(20) florets; disarticulation acropetal, paleas persistent; glumes broadly ovate, membranous, 1-veined; lower glumes 0.9–1.4 mm long; upper glumes 1.2–1.6 mm long; lemmas 1.4–1.8 mm long, broadly ovate, membranous, lateral veins evident, apex acute to obtuse; paleas 1.3–1.7 mm long, hyaline, keels scabrous, scabrousities to 0.1 mm long, apex obtuse to acute; stamens 3; anthers 0.1–0.2 mm long, reddish-brown. Caryopsis 0.4–0.7 mm long, ellipsoid, not grooved, smooth to faintly striate, light brown.  $2n = 40, 60$ .

**Comments:** The ring of glandular tissue is most conspicuous below the upper cauline nodes.

**DISTRIBUTION AND HABITAT.** *Eragrostis barrelieri* is an introduced European species that is now naturalized in North America. It grows on gravelly roadsides, in gardens, and in other disturbed, sandy sites, especially near railroad yards, at 10–1,800 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Rancho la Urraca, acceso [access] de Camargo hacia [toward] Ojinaga, desviar hacia [divert toward] Hércules por

terracería [dirt road], aprox. 60 km tomar a la izquierda [take left] 30 km, 19 Oct 2000, Matorral [scrub], G. Gómez 520, 551 (MEXU). **Jiménez:** Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, D. Noya & M.L. Juárez 3402 (CIIDIR); 50 km al

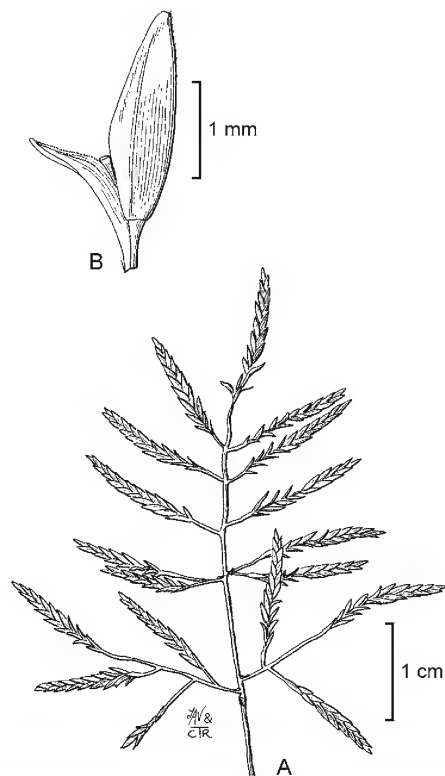


FIGURE 97. *Eragrostis barrelieri*. A. Inflorescence. B. Palea and lemma above. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

S de Jiménez, 15 Aug 2010, 1442 m, D. Ramírez & M.L. Juárez 3416 (CIIDIR). **Juárez:** 14 km S of Cd. Juárez, adj. to the rd to Cd of Chihuahua, 3 Oct 1978, S.D. Koch & I. Sánchez 78114 (US).

**136. *Eragrostis cilianensis*\*** (All.) Vignolo ex Janch., Mitt. Naturwiss. Vereins Univ. Wien, n.s., 5: 110. 1907.

FIGURE 98

Caespitose annual; without innovations. Culms 15–45(65) cm tall, erect or decumbent and prostrate, sometimes with crateriform glands below the nodes. Sheaths overlapping below,  $\frac{2}{3}$  the length of the internodes above, glabrous, occasionally glandular, apex hairy, hairs to 5 mm long; ligules 0.4–0.8 mm long, ciliate; blades (1)5–20 cm long, (1)3–5(10) mm wide, flat to loosely involute, abaxial surfaces glabrous, sometimes glandular near margins, adaxial surfaces scabrous, occasionally also hairy. Panicles (3)5–16(20) cm long, 2–8.5 cm wide, oblong to ovate, condensed to open; primary branches 0.4–5 cm long, appressed or diverging 20°–80° from the rachises; pulvini glabrous or hairy; pedicels 0.2–3 mm long, stout, straight, stiff, usually divergent, occasionally appressed. Spikelets 6–20 mm long, 2–4 mm wide, ovate-lanceolate, plumbeous, greenish, with 10–40 florets; disarticulation below the florets, each floret falling as a unit, rachillas persistent; glumes broadly ovate to lanceolate, membranous, usually glandular; lower glumes 1.2–2 mm long, usually 1-veined; upper glumes 1.2–2.6 mm long, often 3-veined; lemmas 2–2.8 mm long, broadly ovate, membranous, keels with 1–3 crateriform glands, apex obtuse to acute; paleas 1.2–2.1 mm long, hyaline, keels scabrous, sometimes also ciliate, cilia to 0.3 mm long, apex obtuse to acute; stamens 3; anthers 0.2–0.5 mm long, yellow. Caryopsis 0.5–0.7 mm long, globose to broadly ellipsoid, smooth to faintly striate, not grooved, reddish-brown or translucent.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis cilianensis* is an introduced European species that grows in disturbed sites such as pastures and roadsides through most of the North America up to 2,300 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, P.M. Peterson & Annable 5755 (US); Rancho El Morrion, acceso [access] de Aldama hacia [toward] Ojinaga, desviar [divert] en el km 55 a la derecha [to right] 5 km por terracería [dirt road], 24 Oct 2000, matorral [scrub], G. Gómez 629 (MEXU). **Allende:** 20 mi N from Parral to Jiménez on hwy 45, 21 Jul 2006, grassland, 1750 m, K.R. Adams & N. Martínez 056–2006 (CIIDIR). **Ascensión:** Rancho La Viuda Ascensión, 7 Sept 1981, matorral, Serrano & Alvarez 1531 (MEXU); Cerro de Borregas, about 8 km E of Guzmán, 22 Aug 1972, matorral, 1250 m, F. Chiang, T. Wendt & M.C. Johnston 8790H (MEXU). **Buenaventura:** 9 km al S de Buenaventura, 5 Sept 1978, pastizal [pastureland], 1574 m, Melgoza 351 (MEXU). **Camargo:** 20 km S of Cd. Camargo, 1 Aug 1939, 1220 m, L. H. Harvey 1377 (US); km 2 carr. [hwy] Camargo–Chih., 29 Sept 1995, orilla de camino [wayside], 1240 m, Ing. González 89 (MEXU). **Casas Grandes:** Arroyo de

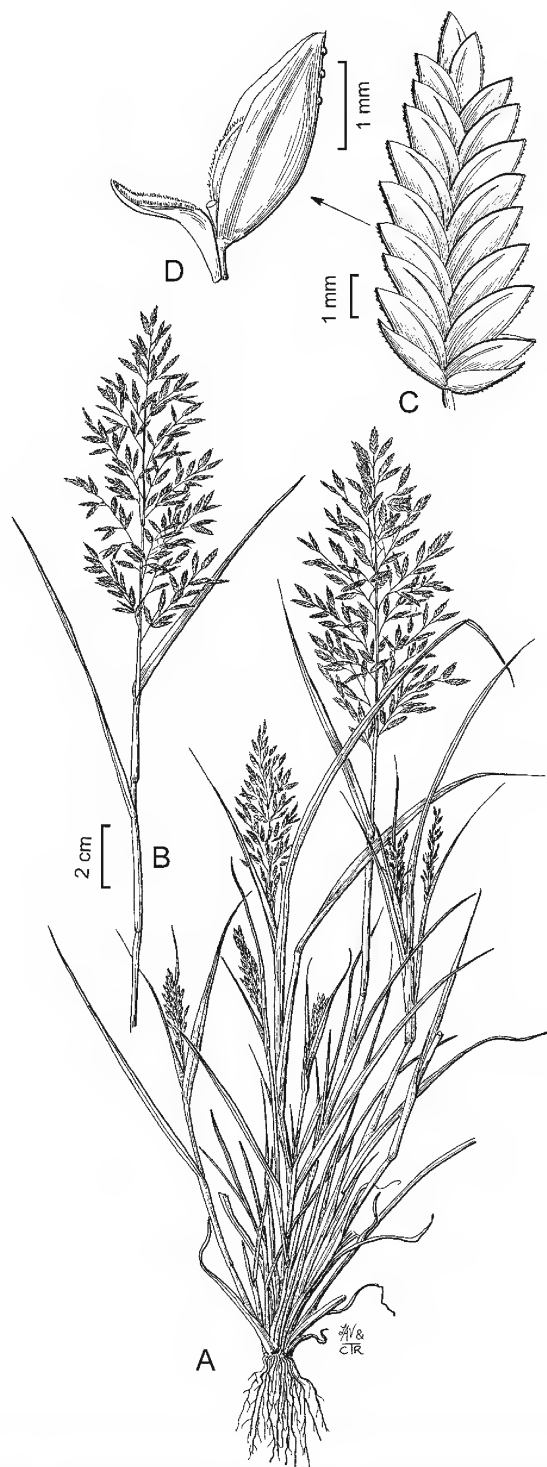


FIGURE 98. *Eragrostis cilianensis*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Palea and lemma above. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

los Nogales, 20 km al S de Col. Juárez, Casas Grandes, 23 Sep 1982, pastizal en barranca [pastureland in canyon], 1450 m, *Tenorio 1603 & Romero* (ENCB, MEXU); Rancho Tapiecitas, acceso de Casas Grandes a Col. Hidalgo, aprox. 20 km desviar a la derecha por terracería 20 km, 4 Oct 2000, pastizal, *G. Gómez 124* (MEXU). **Chihuahua:** Chihuahua, 10 Oct 1935, *LeSueur Mex-083* (US); 5 mi SW of Chihuahua on rd to Cuauhtémoc, 6 Oct 1959, *Soderstrom 901* (MEXU, US); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 19 Oct 1974, pastizal con encinos [oaks], 1700 m, *Rzedowski 32339* (ENCB); La Campana, Potrero El Plan, 4 km E carr. Panamericana, 6 Sep 73, lotes de producción de semilla [seed-production lots], 1500 m, *Valdés-Reyna VR-90* (RELC); carr. Chih-Delicias km 18 entronque [junction] a Mapula, 29 sept 1995, 1520 m, *Quiñones 115* (MEXU); Ejido La Haciendita (EL TARAIS), 16 Aug 1996, pastizal, 2620 m, *Quiñones 117* (MEXU); Presa Chihuahua, 7 Nov 1936, *LeSueur 0122* (MEXU). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock 7738* (US). **Janos:** 10 km W of Carretas, 21 Aug 1939, *L. H. Harvey 1577* (US); Chihuahua-Sonora Border, Rancho Carretas, 26 Aug 1937, 1450 m, *L. H. Harvey 1592* (US); Mexican boundary line near White Water, 11 Sep 1893, *E.A. Mearns 2273* (US); 10 km antes [before] de Janos, (carr. Casas Grandes-Cd. Juárez), 23 Oct 74, *Valdés-Reyna VR-753* (RELC). **Jiménez:** Bank of the Río Florido, Cd. Jiménez, 28 Jul 1939, 1340 m, *L. H. Harvey 1324* (US); Sta. Eulalia Mts, 1280 m, *E. Wilkinson 52* (US); 9 mi W of Jiménez, 6 Sep 1967, in thorn scrub, 4500 ft, *Reeder & C. Reeder 4872* (ARIZ, ENCB); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez & M.L. Juárez 3386* (CIIDIR). **Juárez:** 14 km S of Cd. Juárez, along rd to the ciudad of Chihuahua, 3 Oct 1978, *S.D. Koch & I. Sánchez 78113* (US). **Manuel Benavides:** E Chihuahua, vicinity of Pirámide, 12 Aug 1941, *I.M. Johnston 8119* (US). **Ojinaga:** 1 km SW of Rancho San Francisco on the road to Rancho San Fernando, 30 Sep 1972, pastizal, 1400 m, *F. Chiang, T. Wendt & C. Johnston 9596* (MEXU). **Riva Palacio:** Majalca, 18 Aug 1935, *LeSueur Mex-027* (US). **San Francisco del Oro:** Mts by San Francisco del Oro, 19 mi from Parral, *Soderstrom 870-a* (US).

137. *Eragrostis ciliaris*\* (L.) R. Br., Narr. Exped. Zaire 478. 1818.

FIGURE 99

Caespitose annual; without innovations. Culms (3)9–75 cm tall, erect or geniculate in the lower portion, not rooting at the lower nodes, glabrous. Sheaths  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the internodes, hairy on the margins and at the apex, hairs to 4 mm long; ligules 0.2–0.5 mm long; blades 1.8–12(15) cm long, 2–5 mm wide, usually flat, occasionally involute, glabrous or ciliate basally. Panicles 1.7–17 cm long, 0.2–5 cm wide, cylindrical, contracted or open, spikelike, branches forming glomerate lobes or sometimes more open, often interrupted in the lower portion; primary branches 0.4–4 cm long, appressed or diverging up to 50° from the rachises; pulvini usually glabrous, occasionally sparsely pilose; pedicels 0.1–1 mm long, erect, shorter than the spikelets, glabrous. Spikelets 1.8–3.2 mm long, 1–2 mm wide, elliptical-ovate



FIGURE 99. *Eragrostis ciliaris*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



to ovate-lanceolate, yellowish-brown, sometimes with a purple tinge, with 6–11 florets, densely packed next to one another or widely separated; disarticulation basipetal, glumes persistent; glumes ovate to lanceolate, keels scaberulous, veins commonly green, apex acute; lower glumes 0.7–1.2 mm long; upper glumes 1–1.6 mm long; lemmas 0.8–1.3 mm long, elliptical-ovate to lanceolate, membranous, keels scaberulous, lateral veins evident, apex obtuse to acute; paleas 0.8–1.3 mm long, membranous, keels prominently ciliate, cilia 0.2–0.8 mm long, apex obtuse to acute; anthers 2, 0.1–0.3 mm long, purplish. Caryopsis 0.4–0.5 mm long, ovoid, reddish-brown.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis ciliaris* is native to the paleotropics and introduced and naturalized in Mexico and the United States, growing along roadsides, on waste sites, in xerothermic vegetation, and sometimes in saline habitats up to 1,950 m. It may be more widespread than indicated. *Eragrostis ciliaris* var. *ciliaris*, found in Chihuahua, is more common than *Eragrostis ciliaris* var. *laxa* Kuntze, which is known only from the Yucatán.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Chihuahua, Aug 1885, *E. Palmer s.n.* (US). **Guachochi:** 10 km W of La Bufa and 12.9 km NE of Batopilas, 770 m, *P.M. Peterson, Annable & Valdés-Reyna 10851* (US).

138. *Eragrostis curvula*\* (Schrad.) Nees, Fl. Afr. Austral. Ill. 397. 1841.

FIGURE 100

Caespitose perennial; forming innovations at the basal nodes. Culms (45)60–150 cm tall, erect, glabrous or glandular. Sheaths  $\frac{1}{3}$ – $\frac{2}{3}$  the length of the internodes, with scattered hairs, hairs to 9 mm long; ligules 0.6–1.3 mm long; blades 12–50(65) cm long, 1–3 mm wide, flat to involute, abaxial surfaces glabrous, sometimes scaberulous, adaxial surfaces with scattered hairs basally, hairs to 7 mm. Panicles 16–35(40) cm long, (4)8–24 cm wide, ovate to oblong, open; primary branches 3–14 cm long, diverging  $10^{\circ}$ – $80^{\circ}$  from the rachises; pulvini glabrous or not, the hairs up to 3 mm long; pedicels 0.5–5 mm long, appressed, flexible. Spikelets 4–8.2(10) mm long, 1.2–2 mm wide, linear-lanceolate, plumbeous to yellowish, with 3–10 florets; disarticulation irregular to acropetal, proximal rachilla segments persistent; glumes lanceolate, hyaline; lower glumes 1.2–2.6 mm long; upper glumes 2–3 mm long; lemmas 1.8–3 mm long, ovate, membranous, lateral veins conspicuous, apex acute; paleas 1.8–3 mm long, hyaline to membranous, apex obtuse; stamens 3; anthers 0.6–1.2 mm long, reddish-brown. Caryopsis 1–1.7 mm long, ellipsoid to obovoid, dorsally compressed, adaxial surfaces with a shallow, broad groove or ungrooved, smooth, mostly translucent, light brown, bases often greenish.  $2n = 40, 50$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis curvula* is native to southern Africa and introduced in North America. It is often used for reclamation because it provides good ground cover but, once introduced, it easily escapes. In North America, it grows on rocky slopes, at the margins of woods, along

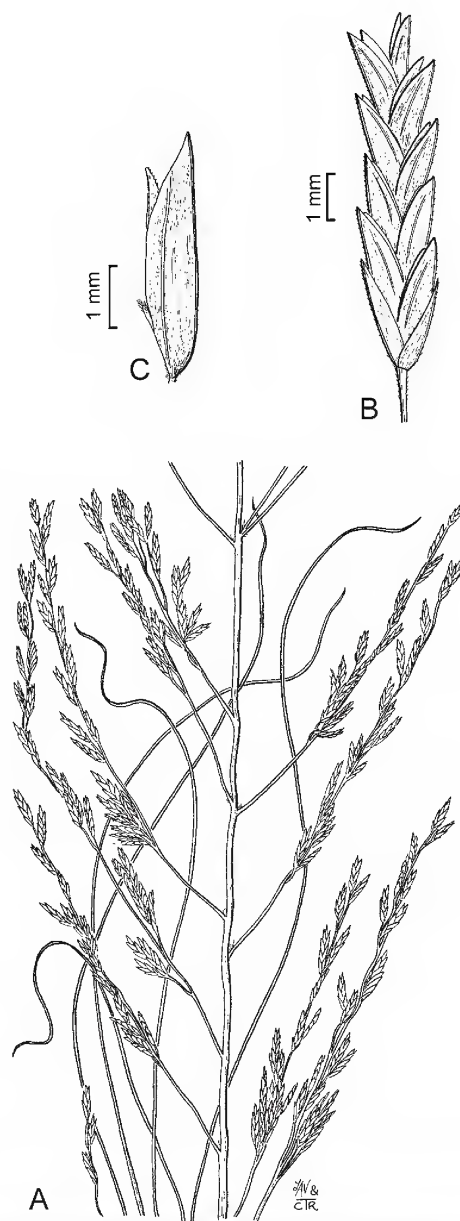


FIGURE 100. *Eragrostis curvula*. A. Inflorescence. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

roadsides, and in waste ground, usually in pine-oak woodlands, and in yellow pine and mixed hardwood forests at 10–2,000 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Barranca de Batopilas, 28 Oct 1973, *Bye 5646* (MEXU). **Chihuahua:** La Campana, 24 Sep 76, Jardín de observación [observation garden], 1500 m, *S. González 764, 766* (RELIC).



139. *Eragrostis echinochloidea*\* Stapf, Fl. Cap. 7: 627. 1900.

FIGURE 101

Caespitose perennial; with innovations. Culms 30–100 cm tall, erect to geniculate, with narrow, sunken glandular bands. Sheaths sometimes glandular, apex hairy, hairs to 5 mm long; ligule 0.4–1 mm long; blades 5–20 cm long, 2–6(7) mm wide, flat to involute, with small crateriform glands on the keels and veins, sparsely pilose adaxially. Panicles 4–19 cm long, 0.8–7 cm wide, oblong to ovate, glomerate, spikelets clustered in 1-sided groups; primary branches 0.5–7.5 mm long, angled, sinuous, glandular; pulvini hairy, hairs to 2 mm long; pedicels 0.2–2 mm long, stout, erect, without a narrow band of abscission line near the apex. Spikelets 2–5 mm long, 2–3.5 mm wide, broadly ovate, greenish, stramineous to plumbeous, with 7–14 florets, disarticulation basipetal, glumes persistent; glumes subequal, 1.7–2.2 mm long, ovate, membranous, keels with small crateriform glands, apex acute to acuminate; lemmas 1.8–2.3 mm long, broadly ovate to orbicular, chartaceous, keels with small crateriform glands, apex acute to obtuse; paleas 1.7–2.2 mm long, chartaceous, each side with a broad wing at the base, wings often projecting beyond the lemma bases, apex acute; anthers 3, 0.5–0.9 mm long, yellowish. Caryopsis 0.8–1.1 mm long, ellipsoid, reddish-brown.  $2n = 30$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis echinochloidea* is native to southern Africa and seems to be spreading rapidly in Mexico. It is now established in Chihuahua and San Luis Potosí, Mexico, and Arizona, United States. It grows in gravelly soils, often along roadsides and sidewalks; 1,800–2,200 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Lote baldío a un costado del periférico [on edge of waste lot] de la Juventud, Plaza Saucito, Cd. Chihuahua, 22 Sep 2009, A. Melgoza *s.n.* (CIIDIR, UACH, US).

140. *Eragrostis erosa* Scribn. ex Beal, Grass. N. Amer. 2: 483. 1896.

FIGURE 102

Caespitose perennial; with innovations, not glandular. Culms 70–110 cm tall, erect, glabrous below the nodes. Sheaths overlapping,  $\frac{1}{2}$  to about as long as the internodes below, hairy at the apex and sometimes on the upper margins, hairs to 4 mm long, not papillose-based; ligules 0.2–0.4 mm long; blades (8)12–30 cm long, 1.5–3.8 mm wide, flat to involute, abaxial surfaces glabrous, adaxial surfaces scaberulous, glabrous or sparsely hairy, hairs to 4 mm long. Panicles 25–45 cm long, (5)12–30 cm wide, broadly ovate, open; primary branches mostly 4–20 cm

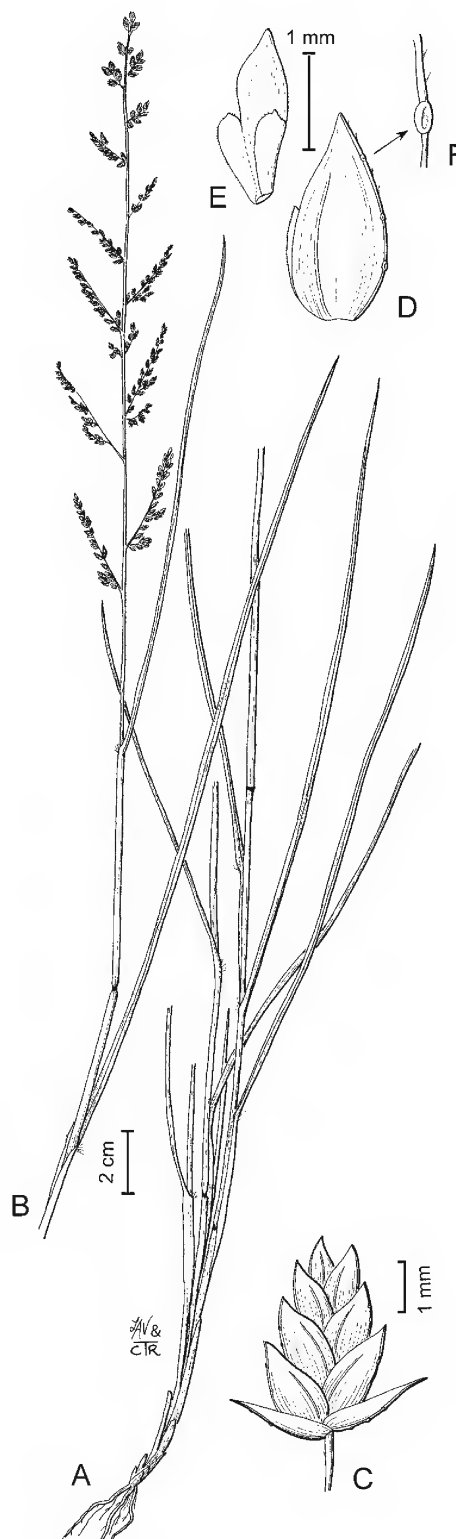


FIGURE 101. *Eragrostis echinochloidea*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Floret. E. Palea. F. Gland along midrib. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

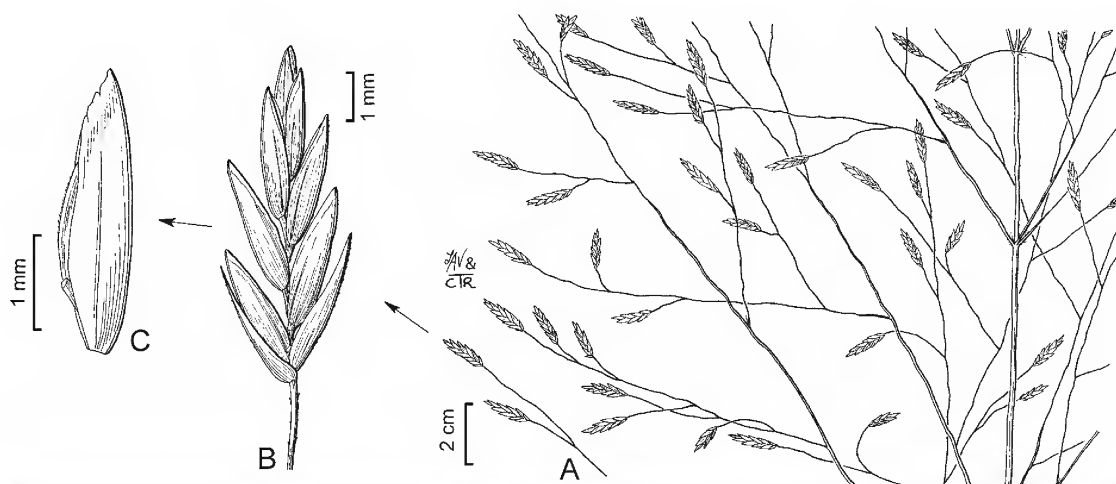


FIGURE 102. *Eragrostis erosa*. A. Inflorescence. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

long, diverging  $20^{\circ}$ – $90^{\circ}$  from the rachises, capillary, sinuous; pulvini glabrous or hairy; pedicels 1–18 mm long, appressed or divergent, proximal spikelets on each branch usually with pedicels shorter than 5 mm long. Spikelets 5–9 mm long, 1–3 mm wide, lanceolate, plumbeous, with 5–12 florets; disarticulation acropetal, glumes first, then the lemmas, paleas persistent; glumes lanceolate to ovate, membranous; lower glumes 1.3–2.4 mm long; upper glumes 1.6–2.6 mm long; lemmas 2.4–3 mm long, ovate, mostly membranous, hyaline near the margins and apex, lateral veins inconspicuous, apex acute; paleas 1.5–3 mm long, hyaline, narrower than the lemmas, apex obtuse to truncate; stamens 3; anthers 0.6–1.7 mm long, purplish. Caryopsis 0.8–1.6 mm long, subellipsoid, terete to somewhat laterally compressed, with a well-developed adaxial groove, faintly striate, opaque, reddish-brown.

**DISTRIBUTION AND HABITAT.** *Eragrostis erosa* is native to North America and grows on rocky slopes and hills, often in association with *Pinus edulis*, *Juniperus monosperma*, and *Bouteloua gracilis*, at 1,100–2,300 m. Its range extends from northern Mexico to New Mexico and western Texas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Sierra de Santo Domingo (Sierra de Palomas on geol. Maps) SW of and above the minas Plomosas, 23 Oct 1972, crasifolio espinosos [thick and spiny-leaved], 1250–1700 m, T.L. Wedt, F. Chiang & M.C. Johnston 9864B (MEXU). **Guachochi:** Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, P.M. Peterson & M.B. Knowles 13582 (US); 8.8 km NE of La Bufa and 4.8 km S of Kirare, 1730 m, P.M. Peterson, Annable & Valdés-Reyna 10823 (US). **Janos:** Pass between Rancho Carretas, Chihuahua and Bavispe, Sonora, 12 Sep 1939, L. H. Harvey 1749 (US). **Jiménez:** Sta. Eulalia Mts, C.G. Pringle 415

(US); Sta Eulalia plains, 27 Oct 1885, E. Wilkinson 56, 341 (US). **Juárez:** Estación Microondas [microwave station] Presidio on a low disjunct peak the NW end of Sierra del Presidio, ca. 24 km S. of Cd. Juárez, 28 Oct 1972, 1500–1623 m, T.L. Wendt, F. Chiang & M.C. Johnston 9912 (MEXU). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino [oak forest], 1200 m, O. Bravo 1919 (CIIDIR, MEXU). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” on ridge top SE side of canyon of Rio Basaseachic leading to falls, 4 Oct 1986, 1800 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8732 (NMC).

141. *Eragrostis intermedia* Hitchc., J. Wash. Acad. Sci. 23(10): 450. 1933.

FIGURE 103

Caespitose perennial; with innovations, not glandular. Culms (30)40–90(110) cm tall, erect, glabrous below the nodes. Sheaths overlapping,  $\frac{1}{2}$  to about as long as the internodes below, sparsely pilose on the margins, apex hairy, hairs to 8 mm long, not papillose-based; ligules 0.2–0.4 mm long; blades (4)10–20(30) cm long, 1–3 mm wide, flat or involute, abaxial surfaces glabrous, adaxial surfaces densely hairy behind the ligules, elsewhere usually glabrous, occasionally sparsely hairy. Panicles 15–40 cm long, (8.5)15–30 cm wide, ovate, open; primary branches 4–25 cm long, diverging  $20^{\circ}$ – $90^{\circ}$  from the rachises, capillary; pulvini hairy or glabrous; pedicels 2–14 mm long, divergent. Spikelets 3–7 mm long, 1–1.8 mm wide, narrowly lanceolate, olivaceous to purplish, with (3)5–11 florets; disarticulation acropetal, paleas persistent; glumes lanceolate to ovate, hyaline to membranous; lower glumes 1.1–1.7 mm long, narrower than the upper glumes; upper glumes 1.3–2 mm long,

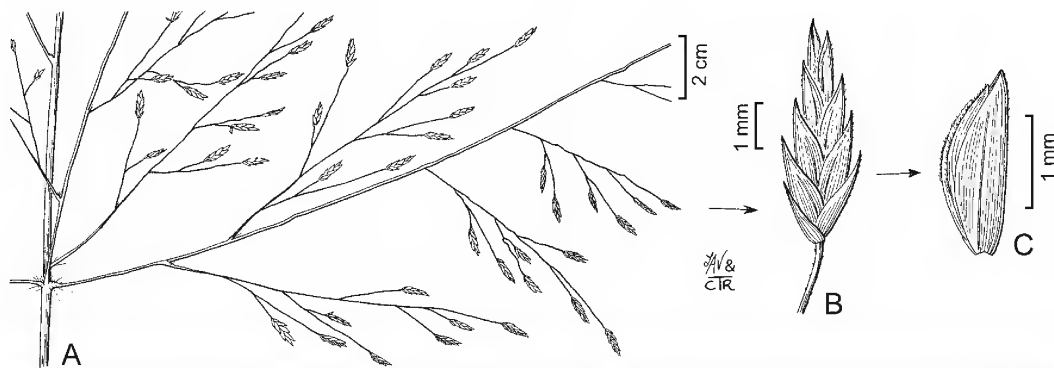


FIGURE 103. *Eragrostis intermedia*. A. Inflorescence. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

apex acuminate to acute; lemmas 1.6–2.2 mm long, ovate, membranous, hyaline near the margins, lateral veins inconspicuous, apex acute; paleas 1.4–2.1 mm long, hyaline, narrower than the lemmas, apex obtuse to acute; stamens 3; anthers 0.5–0.8 mm long, purplish. Caryopsis 0.5–1.0 mm long, straight angular-prismatic, somewhat laterally compressed, with a well-developed adaxial groove, striate, opaque, reddish-brown.  $2n = \text{ca. } 54, 60, 72, \text{ ca. } 74, 80, 100, 120$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis intermedia* is native to the North America and grows in clay, sandy, and rocky soils, often in disturbed sites up to 2,500 m. Its range extends from the United States through Mexico and Central America to South America. *Eragrostis intermedia* is similar to the more widespread *E. lugens*, but differs from that species in having wider spikelets, longer lemmas, and caryopsis with a prominent adaxial groove.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, 1700 m, *Gentry 8157* (US); Arroyo Baqueachi, at 1/2 km E of small villaje, 28 Aug 2003, grassland, 2004 m, *P.M. Peterson & P. Catalán 17572* (CIIDIR, US); Barranca [canyon] between La Bufa and Batopilas, along arroyo to Guimivo N side Rio Batopilas, 16 Aug 1971, 2580 ft, *Bye 1872* (MEXU). **Balleza:** 24.9 km SE of Balleza and 22.5 km N of hwy 24, W of Parral, 26 Sep 1988, grassland, 1900 m, *P.M. Peterson & Annable 5953* (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, pine forest–encino [oak], 2210 m, *P.M. Peterson, Annable & Valdés-Reyna 10715* (CIIDIR, US); 11 mi SE of Balleza on road to Parral, 1800, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13518* (US); 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 1990 m, *P.M. Peterson, Annable & Valdés-Reyna 10745* (CIIDIR). **Bocoyna:** Cañada Recogoata, 23 Sep 1997, pine forest–encino, 1900 m, *B. Tah V. 55* (MEXU). **Chinipas:** Sierra Saguarivo, 1.3 mi W of

Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela 22146* (US). **Chihuahua:** N of Chihuahua, 24 Jul 1936, *LeSueur Mex-097* (US); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 19 Oct 1974, pastizal con encinos [pastureland with oaks], 1700 m, *Rzedowski 32295* (ENCB); Cañón de Santa Clara, 90 km al N de Chihuahua, 19 Oct 1974, 1700 m, *Rzedowski 32360* (ENCB); El Vallecito, 30 km al W de Chihuahua, carr. [hwy] Chihuahua–Cuauhtémoc, 14 Sep 1996, pastizal, 1720 m, *E. Estrada & C. Yen 6084* (ENCB); Rancho Experimental La Campana, 16 Oct 1980, pastizal, 1640 m, *A. Melgoza 641* (CIIDIR); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, 17 Sep 1977, 1500 m, *J.K. Meents & W.H. Moir 70, 85* (NMC); La Campana; Potrero La Sierra, 2 km Ote. [W] Carr. Panamericana, 14 Sep 73, Pastizal con encino, 1550 m, *Valdés-Reyna VR-277* (RELC); mts NW of Chihuahua, 9 Oct 1936, *LeSueur 0144* (MEXU, US); rocky hills near Chihuahua, 19 Oct 1885, *C.G. Pringle 472* (MEXU). **Guachochi:** 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson & Annable 10817* (US); 0.5 km al E de La Bufa at the bridge crossing Río Batopilas, 1000 m, 20 Sep 1991, *P.M. Peterson, Annable & Valdés-Reyna 10846* (US); Entering Barranca El Cobre, approximately 25.7 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2000 m, *P.M. Peterson & Annable 5898* (US); Barranca de Basihuare, 28 Aug 2003, bosque de encino, *P.M. Peterson & P. Catalán 17592* (CIIDIR, US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 24 Aug 1937, 1675 m, *L. H. Harvey 1603, 1626* (US). **Jiménez:** Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, *D. Noya & M.L. Juárez 3410* (CIIDIR). **Madera:** Mesa del Yerbánis, ejido El Long, 12 Oct 1990, bosque de *Quercus*, 1900 m, *O. Bravo 2818* (CIIDIR); N of Chuichupa, 30 Aug 1937, *LeSueur 0208* (MEXU). **Matamoros:** 12 mi S of Villa Matamoros, 7 Sep 1967, *Reeder & C. Reeder 4887* (ARIZ, US). **Moris:** Región de El Carmen, 3 km SW de el Pilar de Moris, 20 Aug 1996, bosque de

encino, A. Búrquez 96-474 (MEXU). **Ocampo:** Parque Nacional "Cascada de Basaseachic," in the barranca [canyon] to W of falls, 4 Oct 1986, 1800 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8823 (NMC); Along drainage of Río Candaseno at Cascada Basaseachi. Ca, 1 mi S of village of Basaseachi, 14 Oct 1984, pine forest-encino, 2000 m, *R. & M. Spellenberg* 7947 (MEXU). **Temosachi:** Nabogame, 24 Jul 1988, 1800 m, *Laferr.* 1538, 1584 (MEXU).

142. *Eragrostis lehmanniana*\* Nees, Fl. Afr. Austral. Ill. 402. 1841.

FIGURE 104

Caespitose perennial; forming innovations at the basal nodes, without glands. Culms (20)40–80 cm tall, erect, commonly geniculate, sometimes rooting at the lower nodes, glabrous, lower portions sometimes scaberulous. Sheaths  $\frac{1}{3}$ – $\frac{2}{3}$  the length of the internodes, sometimes shortly silky pilose basally, hairs less than 2 mm long, apex sparsely hairy, hairs to 3 mm long; ligules 0.3–0.5 mm long, ciliate; blades 2–12 cm long, 1–3 mm wide, flat to involute, glabrous, abaxial surfaces sometimes scaberulous, adaxial surfaces scaberulous. Panicles 7–18 cm long, 2–8 cm wide, oblong, open; primary branches 1–8 cm long, appressed or diverging to 40° from the rachises; pulvini glabrous; pedicels 0.5–4 mm long, diverging or appressed, flexible. Spikelets 5–12(14) mm long, 0.8–1.2 mm wide, linear-lanceolate, plumbeous to stramineous, with 4–12(14) florets; disarticulation irregular to basipetal, paleas usually persistent; glumes oblong to lanceolate, membranous; lower glumes 1–1.5 mm long; upper glumes 1.3–2 mm long; lemmas 1.5–1.7 mm long, ovate, membranous, lateral veins inconspicuous, apex acute to obtuse; paleas 1.4–1.7 mm long, obtuse; stamens 3; anthers 0.6–0.9 mm long, yellowish. Caryopsis 0.6–0.8 mm long, ellipsoid to ob-ovoid, dorsally compressed, sometimes with a shallow adaxial groove, smooth, translucent, mostly light brown, embryo region dark brown with a greenish ring.  $2n = 40, 60$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis lehmanniana* is introduced in North America and native to southern Africa, where it grows in sandy, savannah habitats. In North America, it grows in sandy flats, along roadsides, on calcareous slopes, and in disturbed areas at 1,500–2,300 m. It is commonly found in association with *Larrea tridentata*, *Opuntia*, *Quercus*, *Juniperus*, and *Bouteloua gracilis*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 5 km al N de Flores Magón, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5384 (UACJ). **Ascensión:** Rancho La Viuda Ascensión, 7 Sept 1981, matorral [scrub], 1200 m, *Serrano & Alvarez* 1543 (MEXU); a los lados [sides] de la carr. [hwy] Juárez–Janos, en los alrededores [surroundings] de la Falla del Camello, área de transición de la plataforma del desierto & la depresión [old transition between desert platform and depression] del paleo, "Cabeza de Vaca", 11 Oct 2005, 1180 m, *R. Corral, M. Vargas & H. Gutiérrez* RCD7172 (UACJ). **Chihuahua:** Rancho Experimental La Campana, 82 km

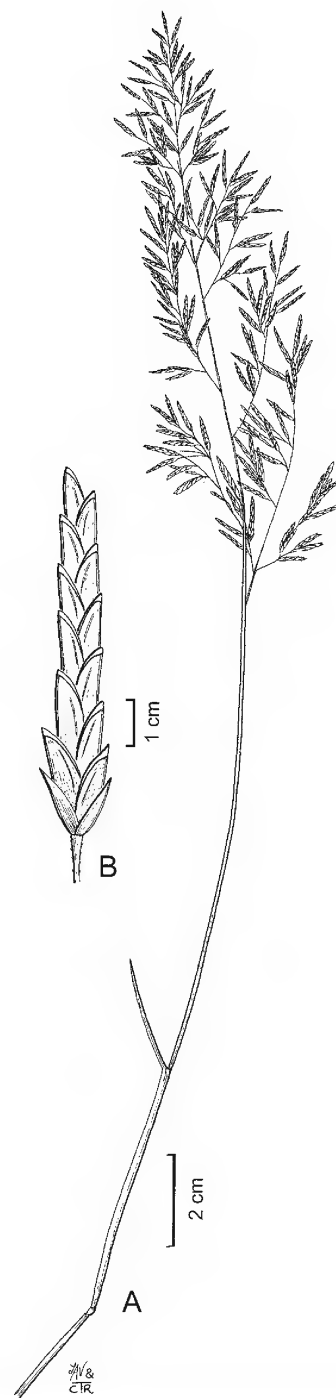


FIGURE 104. *Eragrostis lehmanniana*. A. Culm and inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

al N de la Cd. Chihuahua, 26 Aug 1978, pastizal [pastureland], 1500 m, M.A. Bernal *s/n* (MEXU); carr. Chihuahua-Juárez, 6 Aug 1988, mezquital-pastizal [mesquite-pastureland], Chávez 11 (MEXU); Rancho Experimental La Campana, Chihuahua, 25 Sep 76, pastizal, 1540 m, S. González 786 (ENCB, RELC). **Cuauhtémoc:** Rancho Aguja, acceso [access] de Chihuahua hacia [toward] Namiquipa, desviar [diverge] en "campo 73" a la derecha terrac.[to right dirt road] 6 km, 13 Oct 2000, pastizal, G. Gómez 329 (MEXU). **Namiquipa:** Aprox. km 39 carr. Chihuahua-Namiquipa, 24 Sep 1997, bosque de encino [oak forest], 2300 m, M.A. Vergara 181 (MEXU).

143. *Eragrostis lugens* Nees, Fl. Bras. Enum. Pl. 2: 505–506. 1829.

FIGURE 105

Caespitose perennial; with innovations, not glandular. Culms (20)30–50(60) cm tall, erect, sometimes geniculate, glabrous below the nodes. Sheaths overlapping,  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the internodes above, mostly glabrous, apex hairy, hairs 2–5 mm long, papillose-based, this sometimes not readily seen; ligules 0.2–0.3 mm long; blades (4)8–22 cm long, 1–3.5 mm wide, involute to flat, both surfaces glabrous, margins sometimes with scattered hairs, hairs to 7 mm long. Panicles 16–28 cm long, 10–21 cm wide, ovate, open; primary branches 0.6–1.5 cm long, diverging up to 100° from the rachises, naked basally; pulvini hairy; pedicels 1.4–5(7) mm long, diverging, wiry, present on all spikelets. Spikelets 2–4.5(5) mm long, 0.5–1(1.3) mm wide, narrowly lanceolate, plumbeous to reddish-purple, with 2–7 florets; disarticulation acropetal, paleas persistent; glumes broadly ovate to narrowly lanceolate, hyaline, sometimes

reddish-purple; lower glumes 0.6–1 mm long; upper glumes 1.1–1.4 mm long, usually broader than the lower glumes; lemmas 1.2–1.6 mm long, broadly ovate, mostly membranous but the distal margins hyaline, lateral veins inconspicuous, apex acute; paleas 1.1–1.7 mm long, membranous to hyaline, apex obtuse; stamens 3; anthers 0.2–0.7 mm long, reddish-purple. Caryopsis 0.5–0.6 mm long, obovoid to somewhat prism-shaped, terete to somewhat laterally compressed, with an adaxial groove, finely striate, usually opaque, faintly reddish-brown to whitish.  $2n = 40, 80$ , ca. 108.

**DISTRIBUTION AND HABITAT.** *Eragrostis lugens* is native to North America and grows in montane areas along roadsides and waste places up to 2,500 m. Its range extends from the southern United States to Peru and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** km 52 carr. [hwy] Chihuahua–Cd. Juárez, 3 Aug 1978, pastizal [pastureland], 1450 m, I.D. Enríquez, Delgadillo, Molinar 7, 12 (MEXU).

144. *Eragrostis mexicana* (Hornem.) Link, Hort. Berol. 1: 190. 1827.

Caespitose annual; without innovations. Culms 10–130 cm tall, erect, sometimes geniculate, glabrous, sometimes with a ring of glandular depressions below the nodes. Sheaths  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the internodes, sometimes with glandular pits, pilose near the apex and on the collars, hairs to 4 mm long, papillose-based; ligules 0.2–0.5 mm long, ciliate; blades 5–25 cm long, 2–7(9) mm wide, flat, abaxial surfaces glabrous, adaxial surfaces scaberrulous, occasionally pubescent near the base. Panicles (5)10–40 cm long, (2)4–18 cm wide, less than  $\frac{1}{2}$  the height of the plant, ovate,

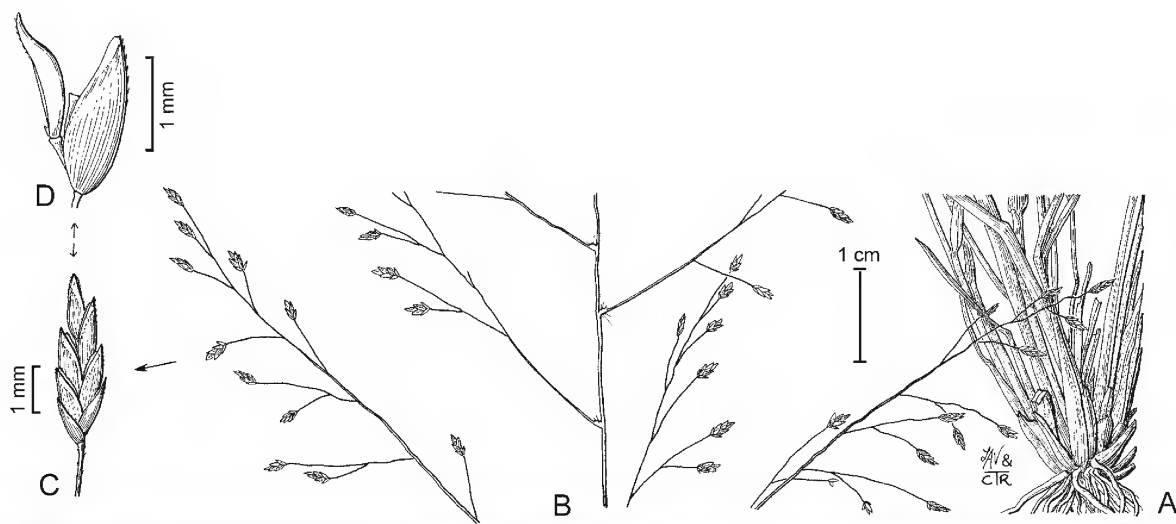


FIGURE 105. *Eragrostis lugens*. A. Habit. B. Inflorescence. C. Spikelet. D. Floret and palea above. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



rachises angled and channeled; primary branches 3–12(15) cm long, solitary to whorled, appressed or diverging to 80° from the rachises; secondary branches somewhat appressed; pulvini glabrous; pedicels 1–6(7) mm long, almost appressed to narrowly divergent, stiff. Spikelets (4)5–10(11) mm long, 1.5–2.4 mm wide, ovate to oblong, gray-green to purplish, with 5–11(15) florets; disarticulation acropetal; glumes 1.2–2.3 mm long, subequal, ovate to lanceolate, membranous; lemmas 1.2–2.4 mm long, ovate, membranous, glabrous or with a few hairs, gray-green, lateral veins evident, often greenish, apex acute; paleas

1–2.2 mm long, hyaline, keels scabrous, apex obtuse to truncate; stamens 3; anthers 0.2–0.5 mm long, purplish. Caryopsis 0.5–0.8(1) mm long, ovoid to straight angular-prismatic, laterally compressed, shallowly to deeply grooved on the adaxial surface, striate, reddish-brown, distal ⅓ opaque.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis mexicana* is native to North America and grows along roadsides, near cultivated fields, and in disturbed open areas at 100–3,000 m.

Two subspecies, *E. mexicana* subsp. *virescens* and *E. mexicana* subsp. *mexicana*, occur in the study area.

#### KEY TO SUBSPECIES OF *ERAGROSTIS MEXICANA*

1. Spikelets 1.2–2.4 mm wide, oblonge-ovoid; first glume 1.2–2.4 mm long . . . . . *E. mexicana* subsp. *mexicana*
1. Spikelets up to 1.5 mm wide, linear to linear-lanceolate; lower glume 0.7–1.7 mm long . . . . *E. mexicana* subsp. *virescens*

#### *Eragrostis mexicana* subsp. *mexicana*.

FIGURE 106

**DISTRIBUTION AND HABITAT.** *Eragrostis mexicana* subsp. *mexicana* grows from Ontario through the mid-western United States to California, South Carolina, and Texas and southward to Mexico, Central America, and northern South America to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 44 km al N del poblado [village] Villa Ahumada por la carr.[hwy] Panamericana (Méx 45), 7 Oct 1995, 1200 m, R. Corral, P. Olivas & J.O. Torres RCD6435 (UACJ). **Balleza:** 11 mi SE of Balleza on road to Parral, 1800, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13522 (US). **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 8, 507 (US). **Bocoyna:** entre [between] Estación Divisadero & Río Urique, rumbo [course] a Barrancas del Cobre, 16 Aug 1976, pine forest–encino [oak], 1875 m, S. González & J.M. Peña 682 (RELC); San Ignacio Arareco, around house of Sebastian Gloria, 7 Oct 1973, pine–oak forest, Bye 5430 (MEXU). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7705 (US). **Casas Grandes:** Casas Grandes, 25 Aug 1899, E.W. Nelson 6300 (US); W of Casas Grandes, 5 mi S of Hernández, 18 Sep 1960, pine–oak region, 2100 m, Reeder, C. Reeder & Soderstrom 3518 (ARIZ, ENCB, US); 8 mi NE of Cuesta Blanca, W of casas Grandes, 18 Sep 1960, Reeder, C. Reeder & Soderstrom 3551 (ARIZ); Rancho Palanganas (La Leona), 11 Sep 1996, pastizal [pastureland], 2200 m, González 113 (MEXU). **Chihuahua:** N of Chihuahua, 20 Oct 1935, LeSueur Mex-047 (US); 8 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, Soderstrom 909 (US); km 1773 carr a Cd. Juárez, 15 Sep 55, pastizal, 1500 m, Hern.-Xol. & V. Mathus N-1792 (RELC). **Cuauhtémoc:** 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9602, 9603 (US); 12 mi W of Cuauhtémoc, 5 Sep 1967, pine and oak covered slopes, 7000 ft, Reeder & C. Reeder 4854 (ENCB); entre Cuauhtémoc & La Junta, 12 Aug 1976, bosque de encino [oak forest], 2185 m, J.M. Peña N. & S. González 565 (RELC). **Guachochi:** Parque Nacional Barranca del Cobre,

0.5 km E of La Bufa at the bridge crossing the Río Batopilas, 1000 m, P.M. Peterson, Annable & Valdés-Reyna 10840 (US); West of Munérachi, 7 Sep 2003, matorral espinoso [thorny scrub], 1200 m, P.M. Peterson & P. Catalán 17713 (US); Barranca de Basihuare, 28 Aug 2003, bosque de encino, 1700 m, P.M. Peterson & P. Catalán 17590 (CIIDIR, US). **Gómez Farías:** Laguna de Babicora, 18 Aug 1994, 2150 m, T. Lebgue & E. Estrada 3348 (NMC). **Guerrero:** 33.5 km W La Junta on road to Parque Nacional Cascada de Basaseachic, 2200 m, P.M. Peterson & Annable 9606 (US); Miñaca, 13 Oct 1910, Hitchcock

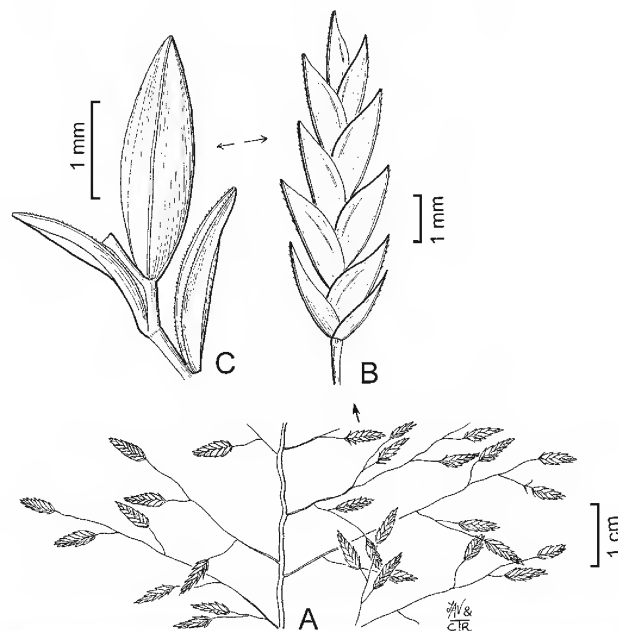


FIGURE 106. *Eragrostis mexicana* subsp. *mexicana*. A. Inflorescence. B. Spikelet. C. Two paleas below lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

7732 (US); entre Cuauhtémoc & La Junta, 12 Aug 1976, bosque de *Quercus*, 2185 m, S. González & J.M. Peña 565 (ENCB). **Ignacio Zaragoza:** 10 mi N of Ignacio Zaragoza, along hwy, pinyon and Juniper, 8 Apr 1977, 7800 ft, Dunn, Torke, Bennet & Wieder 22632 (ENCB). **Janos:** 2 km W of Carretas, 21 Aug 1939, L. H. Harvey 1565 (US); Cañon de Carretas, Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1937, 1460 m, L. H. Harvey 1590 (US). **Jiménez:** Banks of the Río Florido, Cd. Jiménez, 28 Jul 1939, 1340 m, L. H. Harvey 1325 (US). **Madera:** Paraje Sirupa, ejido Cebadilla de Dolores, 24 Aug 1990, bosque de encino, 1200 m, O. Bravo 1253 (CIIDIR, MEXU); Mesa del Yerbanís, ejido El Long, 12 Oct 1990, bosque de *Quercus*, 1900 m, O. Bravo 1842 (CIIDIR, MEXU); Paraje Sirupa, ejido Ce-bollitas, 16 Oct 1990, bosque de encino, 1200 m, A. Benítez 2903 (CIIDIR, MEXU); Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, T. Lebgue, G. Quintana & E. Estrada 3784 (NMC); Arroyo de la Quinta, ejido El Long, 30 Aug 1990, pinyon–encino, 2340 m, A. Benítez 2104 (MEXU). **Manuel Benavides:** Entre Manuel Benavides & Pocitos, 2 Aug 1976, pastizal, 1342 m, S. González & J.M. Peña 457 (RELC). **Moris:** Mesa del Agua, 4.8 km S of Campanero (on Mesa de Campanero), 29 Sep 2003, 1990 m, T.R. Van Devender, A.L. Reina, M.A. Dimmitt & M.W. Eubanks 2003-1097 (NMC). **San Francisco del Oro:** San Francisco del Oro, Arroyo de Gra-nádena, 4 Oct 1959, Soderstrom 878 (US). **Temosachi:** Nabogame, 10 Sep 1987, 1800 m, Laferr. 1063 (MEXU).

*Eragrostis mexicana* subsp. *virescens* (J. Presl) S. D. Koch & Sánchez Vega, Phytologia 58: 380. 1985.

**DISTRIBUTION AND HABITAT.** Native from Canada, United States, Mexico, and South America. In Mexico it is found in Baja California, Baja California Sur, and Chihuahua (Espejo Serna et al., 2000).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

145. *Eragrostis palmeri* S. Watson, Proc. Amer. Acad. Arts 18: 182. 1883.

FIGURE 107

Caespitose perennial; with innovations and knotty bases, not glandular. Culms 50–90(120) cm tall, glabrous below the nodes. Sheaths overlapping,  $\frac{1}{2}$  to about as long as the internodes below, villous and the hairs not papillose-based, or mostly glabrous, apex hairy, hairs to 5 mm long; ligules 0.2–0.4 mm long; blades (14)20–35 cm long, 1–2.4 mm wide, involute, abaxial surfaces glabrous, adaxial surfaces scaberrulous, sometimes sparsely hairy. Panicles 12–40 cm long, 4–20 cm wide, oblong, open; primary branches 2–20 cm long, diverging 20°–70° from the rachises, capillary; pulvini glabrous or sparsely hairy; pedicels (0.4)1–4(14) mm long, appressed or diverging, only the terminal pedicels on each branch longer than 4 mm long. Spikelets 4–6(7.3) mm long, 1–2 mm wide, linear-lanceolate, plumbeous, with 5–12 florets; disarticulation acropetal, paleas persistent; glumes lanceolate to ovate, hyaline; lower glumes 1.1–1.8 mm long; upper glumes 1.2–2.2 mm long, exceeded by the basal lemmas; lemmas 2–2.6 mm long, ovate, membranous, hyaline toward the apex and margins, keels weak or strong, without glands, lateral veins from inconspicuous to conspicuous, apex acute; paleas 1.7–2.4 mm long, hyaline, bases not projecting beyond the lemmas, apex truncate, often notched; stamens 3; anthers 0.6–1.3 mm long, yellowish to purplish. Caryopsis 0.6–0.8 mm long, straight angular-prismatic to subellipsoid, laterally compressed, with a well-developed adaxial groove, faintly striate, opaque, reddish-brown.  $2n = 40$ .

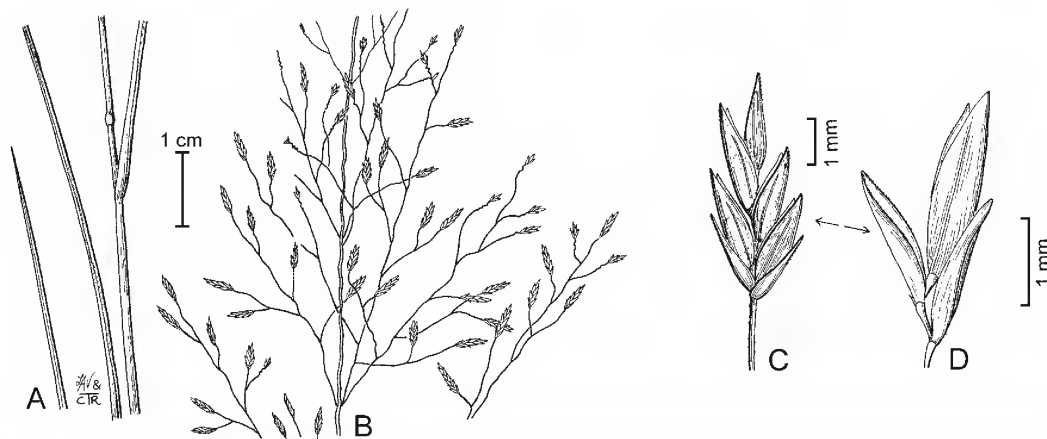


FIGURE 107. *Eragrostis palmeri*. A. Culm, sheath, and blade. B. Inflorescence. C. Spikelet. D. Two paleas below floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Eragrostis palmeri* is native to North America and grows on rocky slopes and hills generally in association with *Pinus*, *Juniperus*, *Bouteloua gracilis*, and *Prosopis* at 300–2,150 m. Its range extends from the southwestern United States to Oaxaca.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Rancho El Morrion, acceso [access] de Aldama hacia [toward] Ojinaga, desviar [divert] en km 55 a la derecha [to right] 5 km por terracería [dirt road], 25 Oct 2000, matorral [scrub], G. Gómez 632 (MEXU). **Mpio.?:** Sierra de los Pinos, Dec 1937, *LeSueur* 0219 (US).

**146. *Eragrostis pectinacea* (Michx.) Nees, Fl. Afr. Austral. Ill. 406. 1841.**

Caespitose annual; without innovations, without glandular pits. Culms 10–80 cm tall, erect to geniculate or decumbent below, glabrous. Sheaths overlapping below,  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the internodes above, hirsute at the apex, hairs to 4 mm long; ligules 0.2–0.5 mm long; blades 2–20 cm long, 1–4.5 mm wide, flat to involute, abaxial surfaces glabrous and smooth, adaxial surfaces scaberrulous. Panicles 5–25 cm long, 3–12(15) cm wide, ovoid to pyramidal, usually open, sometimes contracted;

primary branches 0.6–8.5 cm long, appressed or diverging to 80° from the rachises, solitary or paired at the lowest 2 nodes; pulvini glabrous or sparsely hairy; pedicels 1–7 mm long, flexible, appressed to widely divergent, sometimes capillary. Spikelets 3.5–11 mm long, 1.2–2.5 mm wide, linear-oblong to narrowly lanceolate, plumbeous, yellowish-brown or dark reddish-purple, with 6–22 florets; disarticulation acropetal, paleas persistent; glumes subulate to ovate-lanceolate, hyaline; lower glumes 0.5–1.5 mm long, at least  $\frac{1}{2}$  as long as the adjacent lemmas; upper glumes 1–1.7 mm long, usually broader than the lower glumes; lemmas 1–2.2 mm long, ovate-lanceolate, hyaline to membranous, grayish-green proximally, reddish-purple distally, lateral veins moderately conspicuous, apex acute; paleas 1–2 mm long, hyaline to membranous, keels scaberrulous, apex obtuse; stamens 3; anthers 0.2–0.4 mm long, purplish. Caryopsis 0.5–1.1 mm long, pyriform, slightly laterally compressed, smooth, faintly striate, brownish.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis pectinacea* is native from southern Canada to Argentina. It grows in disturbed sites such as roadsides, railroad embankments, gardens, and cultivated fields up to 2,400 m. Two varieties occur in Chihuahua.

#### KEY TO VARIETIES OF *ERAGROSTIS PECTINACEA*

1. Pedicels appressed, rarely diverging to 20° from the rachises ..... *E. pectinacea* var. *pectinacea*  
 1. Pedicels widely divergent, usually diverging 20°–60° from the rachises ..... *E. pectinacea* var. *miserrima*

*Eragrostis pectinacea* var. *miserrima* (E. Fourn.) Reeder, *Phytologia* 60(2): 154. 1986.

Pedicels widely divergent, usually spreading 20°–60° from the branches.

**DISTRIBUTION AND HABITAT.** *Eragrostis pectinacea* var. *miserrima* grows in the southern United States, from Texas to Florida, and south throughout Mexico to the lowland tropics of Brazil.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes:** Between Casas Grandes and Sabinal, 4–5 Sep 1899, *E. W. Nelson* 6353 (US). **Chihuahua:** N of Chihuahua, 20 Oct 1935, *LeSueur Mex-078* (MEXU, US). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7733 (US); 2 km al S de Miñaca, 10 Aug 1975, 2000 m, *J. M. Peña JMP-117* (ENCB, RELC). **Janos:** San Pedro River, Mexican boundary line, 11 Sep 1893, *E. A. Mearns* 2309 (US); Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, *L. H. Harvey* 1591, 1604 (US). **Madera:** 30 mi N of Madera, 7 Jul 1950, *Reeder, C. Reeder & Goodding* 1224 (US). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P. M. Peterson & Annable* 5765 (US).

*Eragrostis pectinacea* (Michx.) Nees var. *pectinacea*.

FIGURE 108

Pedicels appressed or diverging to 20° from the branch axes.

**DISTRIBUTION AND HABITAT.** *Eragrostis pectinacea* var. *pectinacea* grows throughout the range of the species, including most of the states within Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 5 km al S de Villa Ahumada, sobre la carr. [on hwy] Cd. Chihuahua, matorral desértico [desert scrub], 3 Oct 1978, *S. D. Koch & I. Sánchez* 78116 (ENCB, US). **Bachiniva:** 2 km de San José de Bachiniva, 9 Aug 1974, suelo arcilloso [clay ground], 1900 m, *C. Rodríguez, O. Agundis & S. Acosta* 1249 (ENCB, CHAPA, US). **Balleza:** 43 mi E of Guachochi and 16 mi W of Balleza, 2100 m, *P. M. Peterson & Annable* 5936 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 2210 m, *P. M. Peterson, Annable & Valdés-Reyna* 10702 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, pine forest–encino [oak], *P. M. Peterson, Annable & Valdés-Reyna* 10718 (CIIDIR, US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P. M. Peterson* 20027, *F. Sánchez Alvarado & E. P. Gómez Ruiz* (CIIDIR, US). **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Uriquecrossing towards Basihuare and Creel, 5 Sep 2008, *P. M. Peterson & J. M. Saarela* 22049 (US); SW Chihuahua, Aug 1885, *E. Palmer* 8B, 50 (US). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7689 (US); a 5 km al N de Creel, 16 Sep 1983, pine forest–encino, 2200 m, *Tenorio L. & R. Torres* 4392 (MEXU). **Camargo:** Arroyo 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1394 (US);

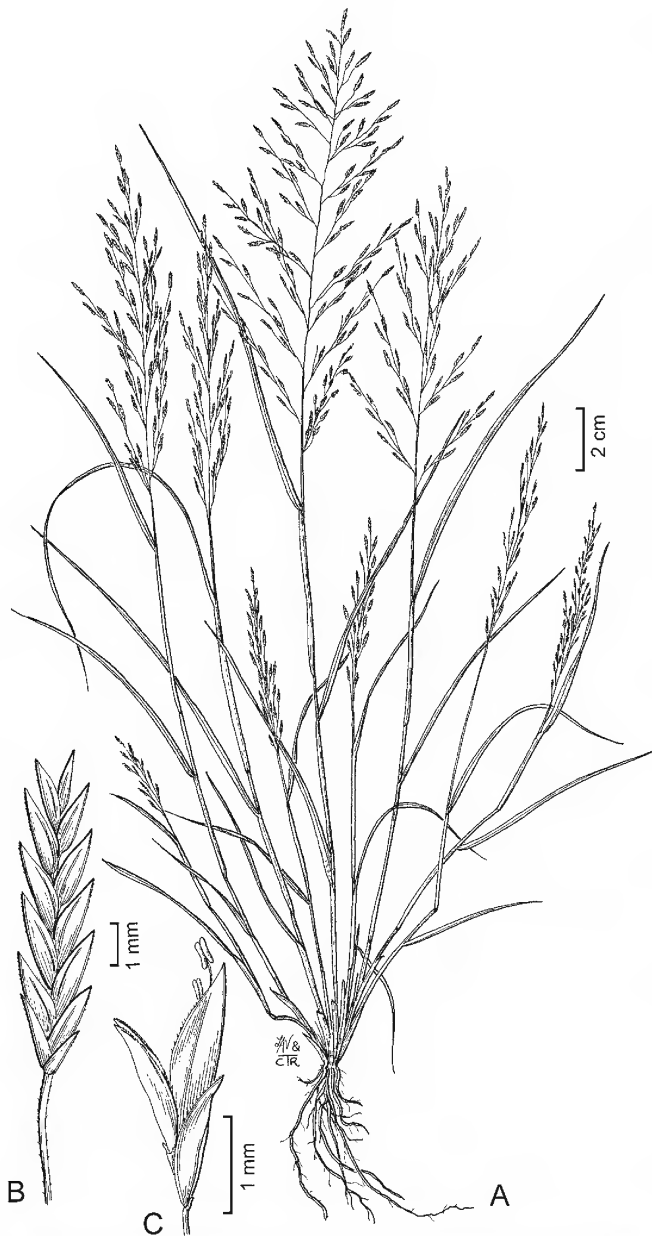


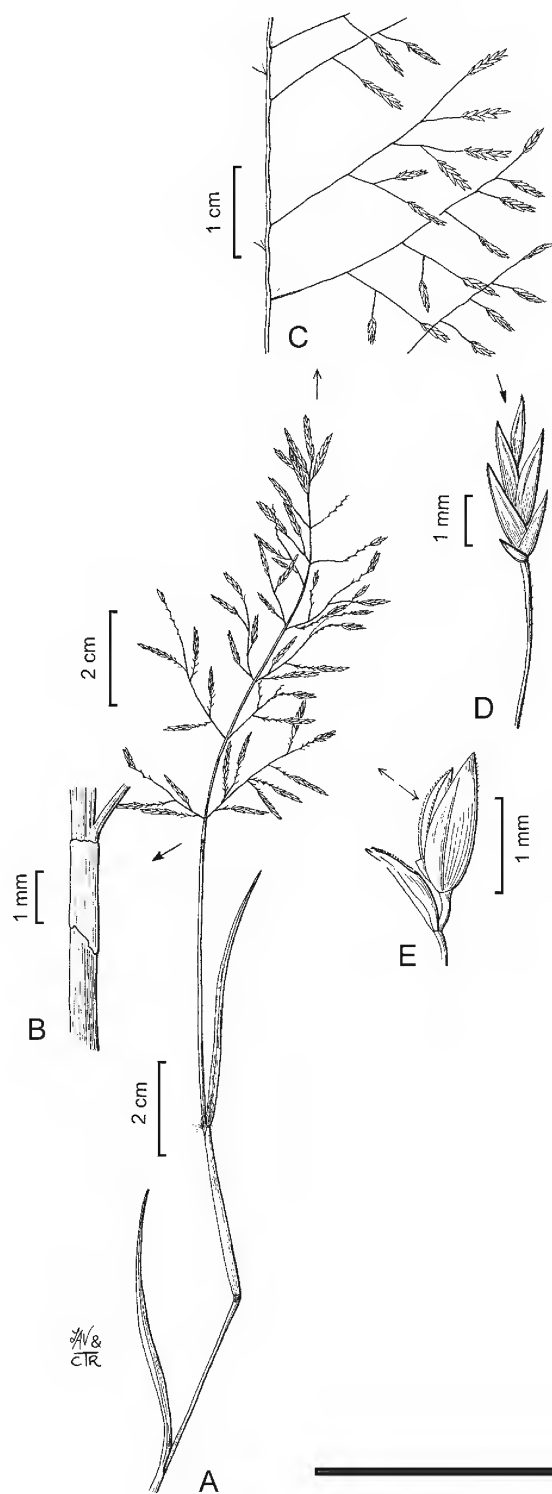
FIGURE 108. *Eragrostis pectinacea* var. *pectinacea*. A. Habit. B. Spikelet. C. Two paleas below floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

Rancho la Urraca, acceso [access] de Camargo hacia [toward] Ojinaga, desviar hacia [divert toward] Hércules por terracería [dirt road], aprox. 60 km tomar a la izquierda [take left] 30 km, 20 Oct 2000, Matorral, G. Gómez 550 (MEXU). **Chihuahua**: near Chihuahua, 24 Aug 1885, C.G. Pringle 416 (US); N

of Chihuahua, 20 Jul 1936, *LeSueur* 0126 (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, *Soderstrom* 898 (US); 12 mi N of Chihuahua on rd to Cd. Juárez, 8 Oct 1959, *Soderstrom* 933 (US); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, 1500 m, *J.K. Meents & W.H. Moir* 93 (NMC). **Cuauhtémoc**: 11 mi W of Cuauhtémoc, 4 Sep 1967, *Reeder & C. Reeder* 4863 (ARIZ); 12 mi W of Cuauhtémoc, 5 Sep 1967, *Reeder & C. Reeder* 4847 (ENCB, US); 4879 (ARIZ); 4854 (US). **Gran Morelos**: 47 mi W of cd Chihuahua on Chih 16, 7 oct 1972, 6000 ft, *L. H. Harvey & J.T. Witherspoon* 9295 (ENCB). **Guachochi**: Parque Nacional Barranca del Cobre, 20 mi NW of Aborreachi on road towards Creel, 2390 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13563 (US); 12.4 km S of Cusarare on road to Guachochi, 2400 m, *P.M. Peterson & Annable* 5891 (US); Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, *P.M. Peterson & P. Catalán* 17584 (CIIDIR, US). **Guerrero**: 38.6 km SW of La Junta and approx... 70.8 km N of Creel at P. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable* 5844 (US). **Janos**: Cañon de Carretas, Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1937, 1460 m, *L. H. Harvey* 1591 (US). **Jiménez**: Banks of Río Florido, Cd. Jiménez, 28 Jul 1939, 1340 m, *L. H. Harvey* 1313, 1334 (US); 9 mi W of Jiménez, 6 Sep 1967, *Reeder & C. Reeder* 4870 (ENCB); 4873 (ARIZ, US); 14 mi SE of Jiménez, 3 Sep 1967, *Reeder & C. Reeder* 4840 (ARIZ-4836, US); Zona del Silencio, 5 Aug 1976, matorral de *Prosopis–Condalia*, 1098 m, *S. González & J.M. Peña* 528 (ENCB, RELC). **Hidalgo del Parral**: 2 mi E of Parral, 3 Oct 1959, *Soderstrom* 858 (US). **Madera**: Nueva Madera, 8 Aug 1974, cultivo de maíz [corn crop], 2050 m, *C. Rodríguez, O. Agundis & S. Acosta* 1230 (CHAPA, ENCB, MEXU). **Manuel Benavides**: E Chihuahua, vicinity of Pirámide, 11 Aug 1941, *I.M. Johnston* 8137 (US). **Meoqui**: 4 km antes de [before] Rosales, 6 Aug 1974, suelo arcilloso, 1250 m, *C. Rodríguez, O. Agundis & S. Acosta* 1212 (CHAPA, ENCB). **Nuevo Casas Grandes**: Rancho el Pilo a 6.5 km del Rancho Santa Rosa, 7 Aug 1979, *M.A. López s.n.* (ENCB). **Ocampo**: Parque Nacional “Cascada de Basaseachic,” at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8653 (NMC); Parque Nacional Cascada Basaseachic, canyon along Río Candamene leading to falls, 4 Oct 1986, 1800 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8859 (NMC); Parque Nacional “Cascada de Basaseachic,” near hotel, 25 Oct 1992, 2050 m, *Spellenberg* 11672 (NMC). **Riva Palacio**: 2.7 km W of Nuevo Majalca, 17.2 km W of Hwy 45, 1700 m, *P.M. Peterson & Annable* 5775 (US); Nuevo Majalca, 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P.M. Peterson & Annable* 5764 (US); Majalca, 18–20 Aug 1935, *LeSueur* Mex-035 (US); Majalca (Pilares), 11 Aug 1939, 2075 m, *L. H. Harvey* 1460 (ENCB). **Saucillo**: along Isla de Perla road about 4 mi E of cd. Delicias, 11 Jul 1950, in cultivated and irrigated valley, *Reeder, C. Reeder & Goodding* 1262 (ENCB).

147. *Eragrostis pilosa*\* (L.) P. Beauv., Ess. Agrostogr. 71: 162, 175. 1812. *Poa pilosa* L., Sp. Pl. 1: 68. 1753.

FIGURE 109



Caespitose annual; without innovations. Culms 8–45(70) cm tall, erect or geniculate, glabrous, occasionally with a few glandular depressions. Sheaths overlapping below, about  $\frac{1}{2}$  as long as the internodes, mostly glabrous, occasionally glandular, apex hirsute, hairs to 3 mm long; ligules 0.1–0.3 mm long, ciliate; blades 2–15(20) cm long, 1–2.5(4) mm wide, flat, abaxial surfaces glabrous, occasionally with glandular pits along the midrib, adaxial surfaces scaberulous. Panicles 4–20(28) cm long, 2–15(18) cm wide, ellipsoid to ovoid, diffuse; primary branches 1–10 cm long, diverging  $10^{\circ}$ – $80^{\circ}$ ( $110^{\circ}$ ) from the rachises, capillary, whorled on the lowest 2 nodes, rarely glandular; pulvini glabrous or hairy; pedicels 1–10 mm long, flexible, appressed or divergent. Spikelets (2)3.5–6(10) mm long, 0.6–1.4 mm wide, linear-oblong to narrowly ovate, plumbeous, with (3)5–17 florets; disarticulation acropetal, paleas tardily deciduous, rachillas persisting longer than the paleas; glumes narrowly ovate to lanceolate, hyaline; lower glumes 0.3–0.6(0.8) mm long; upper glumes 0.7–1.2(1.4) mm long; lemmas 1.2–2 mm long, ovate-lanceolate, membranous to hyaline, grayish-green proximally, reddish-purple distally, lateral veins inconspicuous, apex acute; paleas 1–1.6 mm long, membranous to hyaline, keels scaberulous to scabrous, apex obtuse; stamens 3; anthers 0.2–0.3 mm long, purplish. Caryopsis 0.5–1 mm long, obovoid to prism-shaped, adaxial surfaces flat, smooth to faintly striate, light brown.  $2n = 40$ .

SPECIMENS EXAMINED. MEXICO. Chihuahua. E. Palmer 507 (MEXU); Gentry 1854 (MEXU).

148. *Eragrostis pringlei* Mattei, Contr. Biol. Veg. 4: 241. 1909.

Caespitose annual. Culms 10–25 cm tall. Sheaths papillose-hirsute, hairy at the collar; ligules 0.3–0.4 mm long; blades 1.5–5 cm long, 1–4 mm wide, generally wider toward base, densely papillose-hirsute. Panicles 7–10 cm long, 0.5–2.5 cm wide, oblong-ellipsoid, pedicels 1.8–2.5 mm long, with a glandular ring in the central part. Spikelets 1.7–2.3 mm long, ovate, with 2–3(5) florets; glumes unequal, shorter than lemma, lower glumes 0.5–0.8 mm long, upper glumes 0.8–1.1 mm; lemmas 1–1.4 mm long, inconspicuously veined, dark at maturity; palea 0.9–1.2 mm long, persistent. Caryopsis subglobose, ca. 0.5 mm long, minutely striate, the surface with a crustaceous layer.

DISTRIBUTION AND HABITAT. *Eragrostis pringlei* is native to North America and grows in prairies, limestone mesas, oak forest, and grasslands at 2,000–2,200 m, often in association with *Prosopis*. It is found in the following states of

FIGURE 109. *Eragrostis pilosa*. A. Culm and inflorescence. B. Glandular band. C. Inflorescence. D. Spikelet. E. Palea below floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



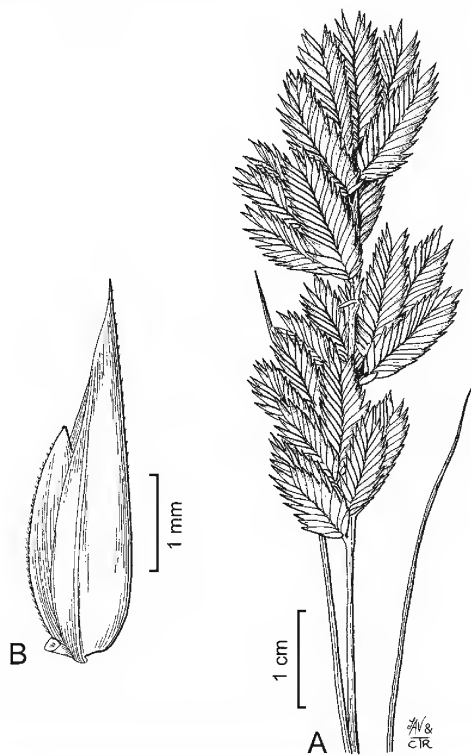
Mexico: Chihuahua, Durango, Guanajuato, Jalisco, Michoacán, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guerrero:** Between Cd. Guerrero and Creel, 3 Aug 1974, *Beetle M-3282* (US); 11 km E Tomochic, 6 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8889* (MEXU, NMC). **Madera:** 2 mi N of Madera in a park-like stand of *Pinus latifolis*, 9 Sep 1953, 2165 m, *Reeder & C. Reeder 2647* (ENCB, MEXU). **Ocampo:** Parque Nacional Cascada de Basaseachic, near hotel, 25 Oct 1992, 2050 m, *Spellenberg 11674* (MEXU, NMC).

149. *Eragrostis secundiflora* J. Presl, Reliq. Haenk. 1(4-5): 276. 1830.

FIGURE 110

Caespitose perennial; with innovations, not glandular. Culms 30–75 cm tall, erect, glabrous below. Sheaths overlapping below,  $\frac{1}{2}$  as long as the internodes above, mostly glabrous, hairy at the apex, hairs to 4 mm long; ligules 0.2–0.3 mm long; blades 10–25(40) cm long, 1–5 mm wide, involute, glabrous abaxially, scaberulous adaxially, sometimes also sparsely pilose. Panicles (3)5–30 cm long, 1–15 cm wide, from narrowly



**FIGURE 110.** *Eragrostis secundiflora* subsp. *oxylepis* (Torr.) S.D. Koch. A. Inflorescence. B. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

oblong, glomerate, and interrupted below to ovate and open; primary branches 0.5–12(16) cm long, appressed or diverging up to 40° from the rachises, stiff; pulvini glabrous or sparsely hairy; pedicels 0–1(3) mm long, appressed, flattened. Spikelets 6–16(23) cm long, 2.4–5 mm wide, ovate to linear-elliptic, flattened, stramineous, with reddish-purple margins or completely reddish-purple, with 10–45 florets; disarticulation basipetal, florets falling intact and before the glumes; glumes ovate-lanceolate to lanceolate, membranous; lower glumes 1.7–3 mm long; upper glumes 2.2–4 mm long, apex acuminate; lemmas 2–6 mm long, ovate, membranous to leathery, apex usually acuminate or attenuate, sometimes acute; paleas 1.5–3 mm long, membranous to leathery, narrower than the lemmas, apex obtuse, sometimes bifid; stamens 2; anthers 0.2–0.5 mm long, brownish. Caryopsis 0.8–1.3 mm long, ellipsoid, somewhat laterally flattened, smooth, reddish-brown.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** There are two subspecies of *E. secundiflora*; plants from Chihuahua belong to *Eragrostis secundiflora* subsp. *secundiflora*. It is native to North America and grows in sandy soils, dunes, grasslands, beaches, and roadsides up to 1,000 m. The range of *E. secundiflora* extends into southern United States and Mexico in Campeche, Chiapas, Chihuahua, Guerrero, Jalisco, Nayarit, Oaxaca, Quintana Roo, Tabasco, Tamaulipas, Veracruz, and the Yucatán.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

150. *Eragrostis sessilisipica* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 97. 1862.

FIGURE 111

Caespitose perennial; with innovations, not glandular. Culms 30–90 cm tall, erect or decumbent, glabrous below the nodes. Sheaths overlapping below,  $\frac{1}{2}$  to as long as the internodes above, hairy at the apex and on the collars, sometimes also on the distal portion of the margins, hairs to 5 mm; ligules 0.4–0.5 mm long; blades 5–30 cm long, 1–3 mm wide, usually involute, sometimes flat, abaxial surfaces glabrous or sparsely pilose, hairs to 5 mm long, adaxial surfaces scaberulous. Panicles 20–65 cm long, 10–35 cm wide, ovate, open; primary branches 2–20(24) cm long, widely spaced, diverging 20°–100° from the rachises, not rebranched, naked basally; pulvini hairy; pedicels 0–12 mm long, appressed, proximal spikelets on each branch sessile or subsessile, the pedicels shorter than 0.4 mm. Spikelets 5–13 mm long, 1.4–3 mm wide, oblong to oblanceolate, stramineous to reddish-purple, with 3–12 florets; disarticulation tardy, basipetal, in the rachilla below the florets, glumes persistent; glumes lanceolate, broad basally, indurate; lower glumes 2.5–6 mm long; upper glumes 3–6 mm long, apex acuminate; lemmas 3–5 mm long, narrowly ovate to lanceolate, indurate, apex acuminate; paleas 2.4–4.6 mm long, indurate, gibbous basally but the sides not projecting beyond the lemmas, keels ciliolate, apex obtuse; stamens 3; anthers 0.3–0.5 mm long, reddish-brown. Caryopsis 0.9–1.5 mm long, ovoid to

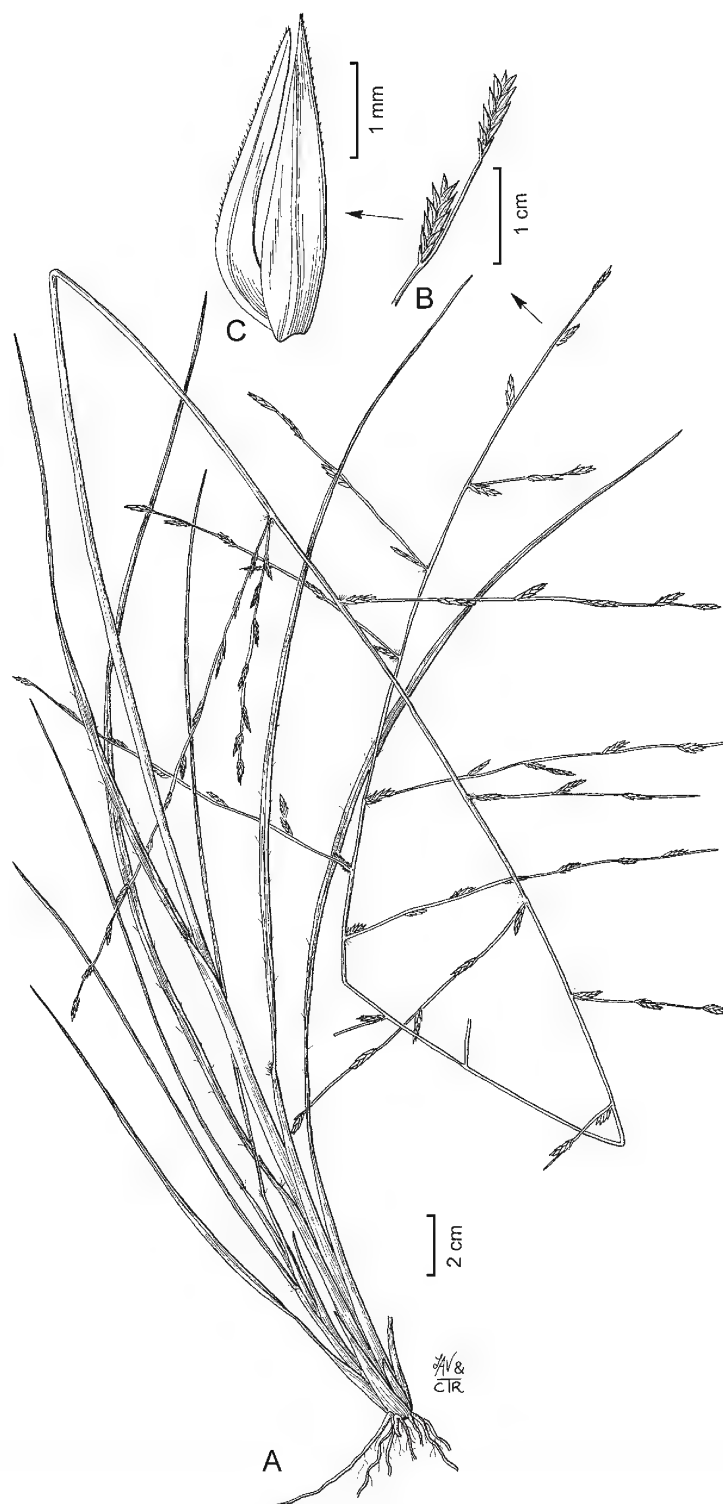


FIGURE 111. *Eragrostis sessilispica*. A.Habit. B. Inflorescence branch. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

pyriform, laterally flattened, tapering distally, smooth to faintly striate, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis sessilispica* is native from the United States and grows in prairies, limestone mesas, thorn forest openings, and grasslands, generally in sandy soils, at 0–300 m, often in association with *Prosopis* and *Quercus*. Its range extends into Texas, New Mexico, Oklahoma, and Kansas to Chihuahua and Tamaulipas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

151. *Eragrostis spectabilis* (Pursh) Steud., Nomencl. Bot. (ed. 2) 1: 564. 1840.

FIGURE 112

Caespitose perennial; with innovations and short, knotty rhizomes less than 4 mm thick. Culms 30–70(85) cm tall, erect

to ascending, often sprawling, glabrous. Sheaths overlapping, hairy on the margins and at the apex, hairs to 7 mm long; ligules 0.1–0.2 mm long; blades 10–32 cm long, 3–8 mm wide, flat to involute, both surfaces usually pilose, sometimes glabrous on both surfaces or glabrous abaxially and sparsely pilose adaxially, often with a line of hairs behind the ligules, hairs to 8 mm long. Panicles (15)25–45(60) cm long, 15–35 cm wide, broadly ovate to oblong, open, basal portions sometimes included in the uppermost sheaths; primary branches (6)12–20 cm long, diverging 20°–90° from the rachises, capillary, naked below; pulvini hairy, hairs to 6 mm; pedicels 1.5–17 mm long, divergent or appressed. Spikelets 3–7.5 mm long, 1–2 mm wide, linear-lanceolate, reddish-purple, sometimes olivaceous, with (4)6–12 florets; disarticulation basipetal, glumes persistent; glumes (1)1.3–2.3 mm long, subequal to equal, lanceolate, membranous to chartaceous; lemmas (1)1.3–2.5 mm long, ovate to lanceolate, leathery, 3-veined, apex acute; paleas (1)1.2–2.4 mm long, membranous, keels sometimes shortly ciliate, apex obtuse to truncate; stamens 3; anthers 0.3–0.5 mm long, purplish. Caryopsis 0.6–0.8 mm long, ellipsoid, strongly flattened, adaxial surfaces with 2 prominent ridges separated by a groove, reddish-brown.  $2n = 20, 40, 42$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis spectabilis* is native in North America, extending from southern Canada through the United States, Mexico, and Belize. It grows in fields and on the margins of woods, along roadsides, and in other disturbed sites, usually in sandy to clay loam soils, and is associated with hardwood forests, *Prosopis*–*Acacia* grasslands, and short grass prairies at 0–1,000 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochic:** camino Guachochic–Creel, 5 km antes del entronque [before junction] a la Bufo, 24 Sep 1981, bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 2700 m, M.E. Siqueiros 1636 (MEXU). **Moris:** 14 km al W de Ocampo, brecha [gap] a Moris, 29 Sep 1985, bosque de encino [oak forest], 1720 m, Tenorio 10029 (MEXU).

152. *Eragrostis superba*\* Peyr., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl. 38: 584. 1860.

FIGURE 113

Caespitose perennial; with innovations, without glands. Culms 45–95 cm tall, erect, glabrous. Sheaths overlapping below,  $\frac{1}{3}$ – $\frac{1}{2}$  the length of the internodes above, hairy at the apex and on the margins, hairs to 6 mm long; ligules 0.5–1.2 mm

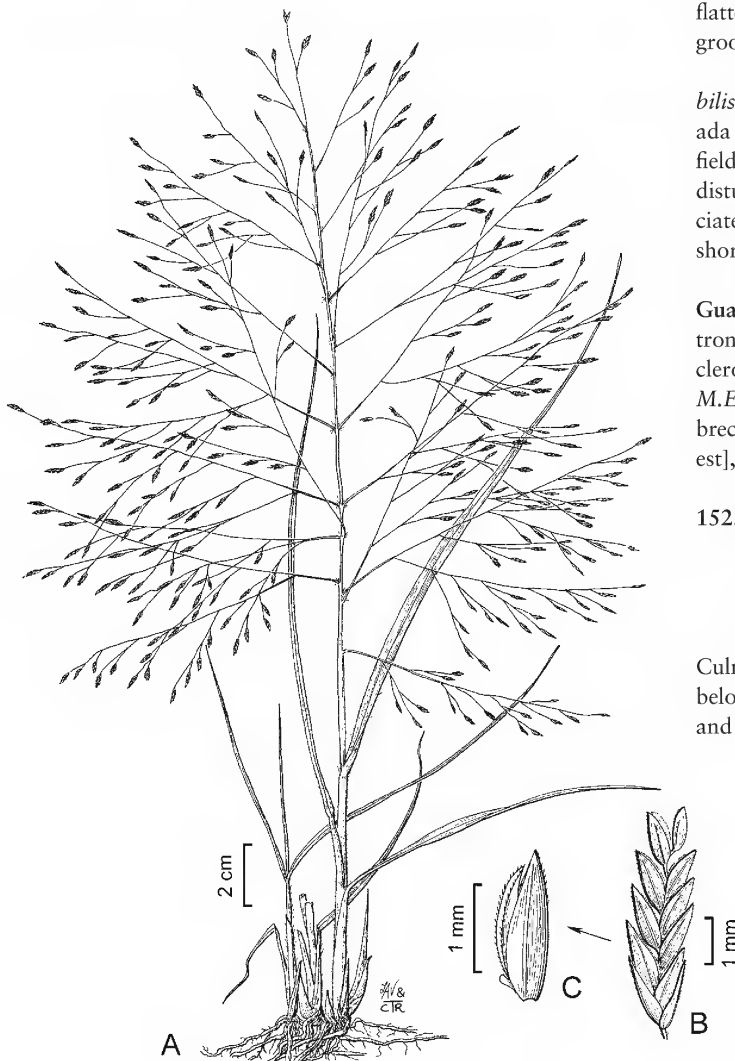
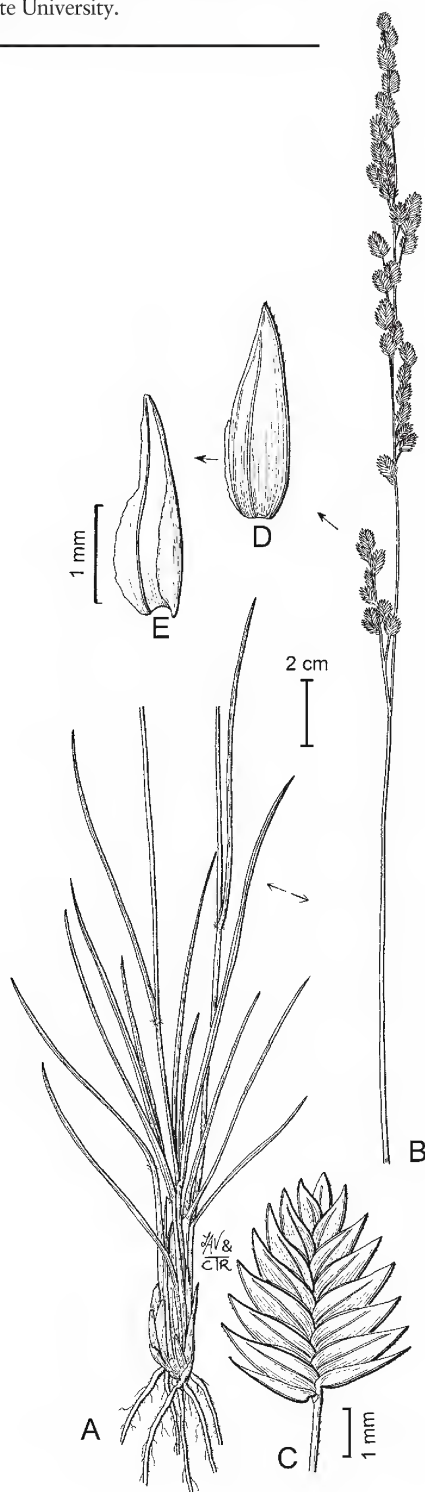


FIGURE 112. *Eragrostis spectabilis*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

FIGURE 113. *Eragrostis superba*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Floret. E. Palea. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



long; blades 7–30 cm long, 2.5–7 mm wide, flat to loosely involute, glabrous abaxially, scabrous adaxially, margins sharply scabrous. Panicles 10–30 cm long, 1–6 cm wide, oblong, condensed, interrupted below; primary branches 1–11 cm long, appressed or diverging to 40° from the rachises, naked basally; pulvini glabrous; pedicels 0.5–2.5 mm long, with a narrow band or abscission line below the apex. Spikelets 5.5–16 mm long, 2.7–9 mm wide, ovate, flattened, greenish to stramineous, sometimes with a reddish-purple tinge, with 4–22 florets; disarticulation below the glumes, spikelets falling intact; glumes 3–4.5 mm long, equal, ovate, chartaceous; lemmas 3–5 mm long, broadly lanceolate, chartaceous to leathery, lateral veins green, apex acute; paleas 3–5 mm long, chartaceous to hyaline, keels broadly winged below, forming a wing or tooth on each side that often projects beyond the lemma bases, apex acuminate; stamens 3; anthers 1.4–2.8 mm long, golden-yellow. Caryopsis 1–2 mm long, ellipsoid, adaxial surfaces flattened, reddish-brown.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Eragrostis superba* is introduced to North America and native to Africa, where it is grown for hay, being fairly palatable and drought resistant. It is also used for erosion control and re-vegetation. It grows on rocky slopes, in sandy flats, and along roadsides, often with *Acacia*, *Prosopis*, *Fouquieria splendens*, *Juniperus*, and *Quercus*, at 480–1,900 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Alrededores [surroundings] de la Cd. de Chihuahua, 3 Sep 1996, 149 m, C. Yen & E. Estrada 5844 (ENCB); Rancho Experimental La Campana, 21 Oct 1981, pastizal [pastureland], 1500 m, G. Melgoza 21 (CIIDIR); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Jun 1977, 1500 m, J.K. Meents & W.H. Moir 130 (NMC); Rancho Experimental La Campana, 13 Sep 73, Jardines de observación [observation gardens], 1500 m, Valdés-Reyna VR-238 (RELC); Rancho Experimental La Campana, 82 km al N de Chihuahua, 26 Aug 1978, pastizal, 1500 m, M.A Bernal & F. Cardenas s/n (MEXU).

### *Eriochloa* Kunth

Annual or perennial; caespitose, sometimes with short rhizomes or stolons, not producing subterranean spikelets. Culms 20–250 cm tall, erect or decumbent, usually with 2–5 nodes. Sheaths open; auricles absent; ligules membranous, ciliate. Inflorescences terminal, panicles of spikelike branches on elongate rachises; branches with many pedicellate, loosely appressed spikelets, terminating in a spikelet, without stiff bristles or flat bracts, spikelets in pairs, triplets, or solitary, often solitary distally when in pairs or triplets at the middle of the branches; pedicels terminating in a well-developed disk; disarticulation below the glume(s). Spikelets with 2 florets, lower florets usually sterile, upper florets bisexual. Lower glumes typically reduced (sometimes absent) and fused with the glabrous callus to form a cuplike structure; upper glumes lanceolate to ovate, glabrous or variously pubescent, 3- to 9-veined, unawned or awned; lower lemmas similar to the upper glumes in length, shape, venation,



and pubescence, unawned; lower paleas absent to fully developed; upper lemmas lanceolate to ovate, indurate, rugose, dull, glabrous, rounded on the back, veins not pronounced, margins involute; anthers 3; lodicules 2, papery; styles with 2 branches,

purple, plumose. Caryopsis not longitudinally grooved; endosperm solid.  $x = 9$ .

*Eriochloa*, a genus of about 37 species, grows in tropical, subtropical, and warm-temperate areas of the world.

#### KEY TO SPECIES OF *ERIOCHLOA*

1. Blades copiously pilose; spikelets 5–8 mm long, unawned and mucous, including the callus; upper lemma lacking a terminal mucro ..... *E. nelsonii*
1. Blades glabrous or almost glabrous; spikelets 3.5–7 mm long (including the callus and awns), awned or mucronate; upper lemma with a terminal mucro of 0.1–0.8 mm long or short-awned, the awn up to 1.5 mm long.
  2. Spikelets 5.5–7 mm long (not including the awn); glumes usually acuminate and awned, the awns 1–4 mm long ..... *E. aristata*
  2. Spikelets 3.5–5 mm long (not including the awn); glumes acute, usually mucronate, the mucro up to 1 mm long.
    3. Blades 5–15 mm wide, puberulent or lanose-pubescent abaxially; racemes 5–20 cm long.
      4. Racemes 5–20 cm long, simple, ascending, puberulent; pedicels puberulent ..... *E. acuminata*
      4. Racemes 3–5 cm long, soft and lax, rachis lanose-pubescent; pedicels with several long hairs besides the lanose pubescence ..... *E. lemmonii*
    3. Blades 1–5 mm wide, glabrous or scabrous-pubescent abaxially; racemes 1–1.5(2) cm long.
      5. Spikelets 4–5 mm long; upper lemma 2.3–3.3 mm long, mucronate, the mucro 0.1–0.3 mm long ..... *E. acuminata*
      5. Spikelets 3.5–4 mm long; upper lemma 2–2.5 mm long, mucronate or awned, the awn up to 1.1 mm long ..... *E. contracta*

153. *Eriochloa acuminata* (J. Presl.) Kunth, Enum. Pl. 1: 72. 1833. *Piptatherum acuminatum* J. Presl, Rel. Haenk. 1(4–5): 221. 1830.

*Eriochloa gracilis* (E. Fourn.) Hitchc., J. Wash. Acad. Sci. 23: 455. 1933.

Caespitose annual. Culms 30–120 cm long, erect or decumbent, sometimes rooting at the lower nodes; internodes glabrous or with scattered hairs; nodes glabrous or pilose. Sheaths sometimes conspicuously inflated, glabrous or pubescent; ligules 0.2–1.2 mm long; blades 5–12(18) cm long, (2)5–12(16) mm wide, linear, flat or folded, straight or lax, glabrous or sparsely pubescent adaxially. Panicles 7–16 cm long, 1–6 cm wide, loosely contracted; rachises scabrous or hairy; branches 5–20, 1–5 cm long, 0.4–0.6 mm wide, appressed to divergent, pubescent, sometimes setose, not winged, with 20–36 spikelets, spikelets mostly in

unequally pedicellate pairs, solitary distally; pedicels 0.1–1 mm long, hairy. Spikelets 3.8–5(6) mm long, 1.1–1.4 mm wide, lanceolate to ovate. Lower glumes absent; upper glumes equaling the lower lemmas, lanceolate to ovate, hairy, 5(7)-veined, acuminate to acute, unawned or awned, awns to 1.2 mm; lower lemmas 3.6–5 mm long, 1.1–1.4 mm wide, lanceolate to ovate, setose, 5(7)-veined, acuminate to acute, unawned; lower paleas absent; anthers absent; upper lemmas 2.3–3.3 mm long, 0.7–0.9 times as long as the lower lemmas, indurate, elliptic, rounded, 5-veined, mucronate, the mucros 0.1–0.3 mm long; upper paleas indurate, blunt, rugose.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Eriochloa acuminata* is native to the southern United States and northern Mexico and has become established outside this region.

#### KEY TO VARIETIES OF *ERIOCHLOA ACUMINATA*

1. Spikelets 4–6 mm long, long-acuminate or narrowed into a short awn; blades usually glabrous but occasionally pubescent ..... *E. acuminata* var. *acuminata*
1. Spikelets less than 4 mm long, acute; blades usually pubescent but occasionally glabrous ..... *E. acuminata* var. *minor*

*Eriochloa acuminata* (J. Presl.) Kunth var. *acuminata*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua.

**Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20022, F. Sánchez Alvarado & E.P. Gómez Ruiz (CIIDIR, US). **Camargo:** Sierra de los Organos, 9 Aug 1936, *LeSueur* 0171 (US). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7703 (US). **Chihuahua:** near Chihuahua, 20 Oct 1936, *LeSueur* 0118 (US); 10 Oct 1935, *LeSueur* Mex-064 (US); 16 Sep 1886, C.G. Pringle 812 (US); 4 Sep 1885, C.G. Pringle 481 (US); Base de la Sierra

de La Campana, 80 km al N de Chihuahua, ladera riolítica con pastizal & encinos [rhyolitic slopes with pastureland and oaks], 19 Oct 1974, 1700 m, *Rzedowski* 32343 (ENCB). **Cuahtémoc:** 4 mi E of General Trias, mesquites and acacias, 14 Sep 1960, 5300 ft, *Reeder*, C. *Reeder* & *Soderstrom* 3462 (ARIZ, ENCB). **Hidalgo del Parral:** About 5 mi N of Parral on road to Chihuahua City, Mesquite savanna, 14 Aug 1950, *Reeder*, C. *Reeder* & *Gooding* 1687 (ENCB). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 22 Aug 1939, 1460 m, L. H. Harvey



1622 (ENCB, US). **Julimes:** Camino entre carr. [path between hwy] Panamericana & Baños de San Diego, cañada [glen] con *Xanthium-Hilaria-Prosopis*, 30 Jul 1976, 1200 m, S. González & J.M. Peña 350 (ENCB). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 3 Oct 1989, grassland, 1910 m, P.M. Peterson & R.M. King 8252 (US). **Práxedes G. Guerrero:** aprox. 3 km al NW del Porvenir, por la carr. Juárez-Porvenir, a los lados de cultivo de algodón [near cultivated cotton], 8 Sep 1994, 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & P. Yañez RCD5403 (UACJ). **Saucillo:** along Isla de Perla road 4 mi E of cd. Delicias, cultivated and irrigated valley, 11 Jul 1950, Reeder, C. Reeder & Goodding 1258, 1261 (ENCB).

*Eriochloa acuminata* var. *minor* (Vasey) R. B. Shaw

SPECIMENS EXAMINED. MEXICO. Chihuahua.

**Chihuahua:** near Chihuahua, 14 Oct 1910, Hitchc. 7778 (US).

**Guachochi:** Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, P.M. Peterson & P. Catalán 17586 (CIIDIR, US). **Guerrero:** Miñaca, 13 Oct 1910, Hitchc. 7753 (US).

154. *Eriochloa aristata* Vasey, Bull. Torrey Bot. Club 13(12): 229. 1886.

FIGURE 114

Annual; caespitose, not rhizomatous. Culms 40–100 cm tall, erect or decumbent, sometimes rooting at the lower nodes; internodes glabrous; nodes 3–10, puberulent. Sheaths glabrous; ligules 0.5–0.8(2) mm long; blades 6–20 cm long, 6–20 mm wide, linear to lanceolate, flat or folded, straight or lax, glabrous (rarely sparsely pubescent) adaxially. Panicles 5–20 cm long, 1–3 cm wide, loosely contracted; rachises hairy; branches 16–30, 20–35 mm long, 0.3–0.5 mm wide, divergent to spreading, setose, not winged, with 20–35 spikelets in unequally pedicellate pairs; pedicels 0.5–3 mm long, hairy, with some hairs 0.5–2.5 mm long, at least distally. Spikelets 4–8.8 mm long, 1.1–1.6 mm wide, lanceolate.; upper glumes 1–1.1 times as long as the lower lemmas, lanceolate, pilose or scabrous above, 5-veined, acuminate and awned, the awns 1–4 mm long; lower florets sterile; lower lemmas 4–8 mm long, 1.1–1.6 mm wide, lanceolate, setose, 3- to 7-veined, acuminate, mucronate, mucro less than 0.4 mm long; lower paleas absent; anthers absent; upper lemmas (2)3–4(6) mm long, 0.4–0.6 times as long as the lower lemmas, indurate, elliptic, acute to rounded, 5-veined, mucronate, the mucro 0.2–0.8 mm long; upper paleas indurate, rugose.  $2n = 36$ .

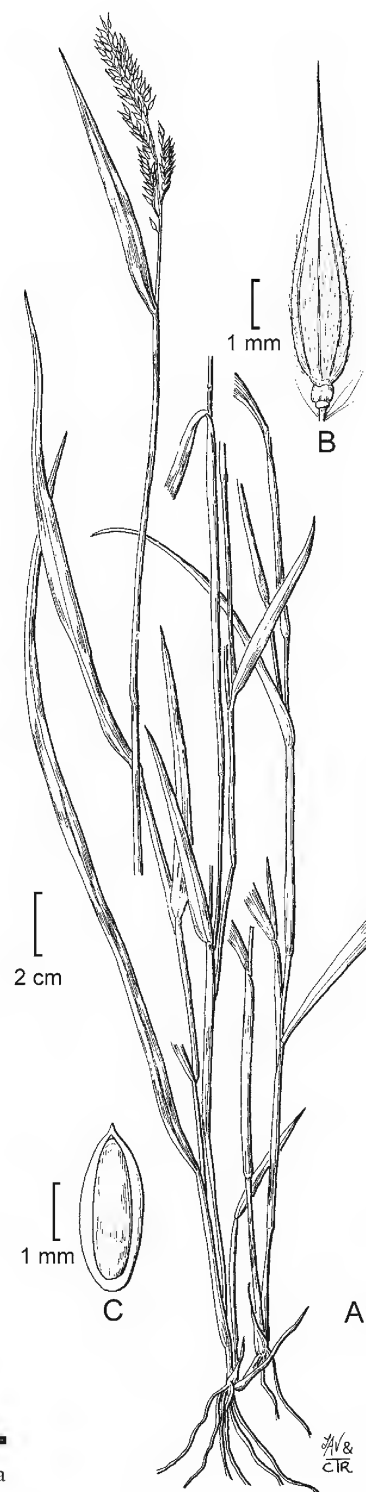


FIGURE 114. *Eriochloa aristata*. A. Habit. B. Spikelet. C. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Eriochloa aristata* is a weed of moist swales, roadsides, and irrigated fields in the southwestern United States. Its range extends through Mexico and Central America to Colombia.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: Chihuahua, Aug 1885, *E. Palmer 110e* (US); Río Bonito, 25 Aug 1936, *LeSueur Mex-094* (US). Hidalgo del Parral: about 5 mi N of Parral on road to Chihuahua City, Mesquite savanna, 14 Aug 1950, *Reeder*; *C. Reeder & Goodding 1686* (ENCB).

155. *Eriochloa contracta*\* Hitchc., Proc. Biol. Soc. Washington 41: 163. 1928.

FIGURE 115

Caespitose annual. Culms 20–100 cm tall, erect or decumbent, sometimes rooting at the lower nodes; internodes pilose or pubescent; nodes pubescent to puberulent. Sheaths sparsely to densely pubescent; ligules 0.4–1.1 mm long; blades 6–12(22) cm long, 2–8 mm wide, linear, flat to conduplicate, straight, appressed to divergent, both surfaces sparsely to densely pubescent with short, evenly spaced hairs. Panicles 6–20 cm long, 0.3–1.2 cm wide; rachises pilose, longer hairs 0.1–0.8 mm; branches

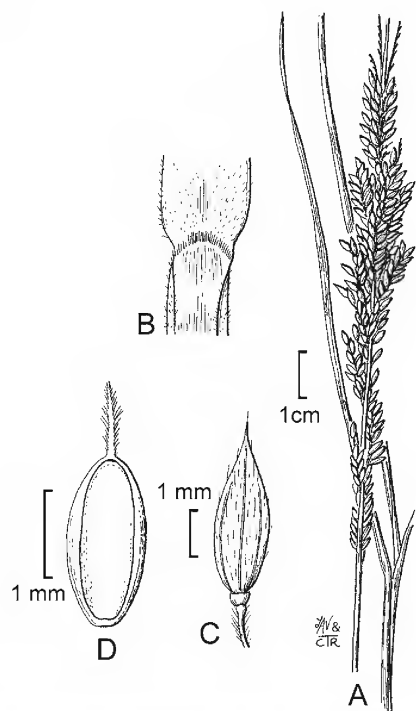


FIGURE 115. *Eriochloa contracta*. A. Inflorescence and leaf blades. B. Ligule. C. Spikelet. D. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

10–20(28), 15–45(60) mm long, 0.2–0.4 mm wide, appressed, pubescent to setose, not winged, with 8–16 mostly solitary spikelets, occasionally paired at the base of the branches; pedicels 0.2–1 mm long, variously hirsute below, apex with fewer than 10 hairs more than 0.5 mm long. Spikelets (3.1)3.5–4.5(5) mm long, 1.2–1.7 mm wide, lanceolate; upper glumes as long as the lower lemmas, with sparsely appressed pubescence on the lower  $\frac{2}{3}$ , scabrous or glabrous distally, 3- to 9-veined, acuminate and awned, awns 0.4–1 mm; lower florets sterile; lower lemmas 3–4.3 mm long, 1.2–1.7 mm wide, lanceolate, setose, 3- to 7-veined, acuminate, unawned or mucronate; lower paleas absent; upper lemmas 2–2.5 mm long, indurate, elliptic, 5- to 7-veined, acute to rounded and mucronate to awned, mucro/ awns 0.4–1.1 mm long; upper paleas indurate, faintly rugose, blunt.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Eriochloa contracta* grows in fields, ditches, and other disturbed areas. It is native and common in the central United States and adventive to the east and southwest.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Balleza: 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 1990 m, *P.M. Peterson, Annable & Valdés-Reyna 10744* (CIIDIR).

156. *Eriochloa lemmonii* Vasey & Scribn., Bot. Gaz. 9(12): 185, pl. 2. 1884.

FIGURE 116

Caespitose annual. Culms 20–80 cm tall, erect or decumbent, sometimes rooting at the lower nodes; internodes densely pubescent to pilose; nodes pubescent to pilose. Sheaths from conspicuously inflated to not inflated, glabrous or pubescent to pilose; ligules 0.5–1 mm long; blades 5–15 cm long, 6–20 mm wide, lanceolate, flat, straight, diverging or ascending, velvety pubescent adaxially. Panicles 5–15 cm long, 0.5–4 cm wide, spreading or contracted; rachises hairy; branches (2)3–8(10), 1–4 cm long, 0.4–0.6 mm wide, appressed or reflexed and spreading, velvety pubescent, not winged, with 10–14 spikelets, spikelets in unequally pedicellate pairs at the middle of the branches, solitary distally; pedicels 0.5–1 mm long, pilose, apex hairy or glabrous. Spikelets 3–4.5(4.9) mm long, 1.2–1.7 mm wide, elliptic; upper glumes equaling the lower lemmas, nearly glabrous or sparsely to densely pilose, elliptic, 5- to 7-veined, acute, unawned; lower lemmas 2.7–4 mm long, 1.2–1.7 mm wide, elliptic, setose to pilose, 5-veined, acute, unawned; lower paleas 1–4 mm long, hyaline; anthers absent or 3; upper lemmas 2.3–3.3 mm long, elliptic, indurate, dull, rough, occasionally with a few long hairs, acute to rounded, sometimes mucronate; upper paleas indurate.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Eriochloa lemmonii*, a rare species, grows in canyons and on rocky slopes in Pima County, Arizona, Hidalgo County, New Mexico, and adjacent Mexico.

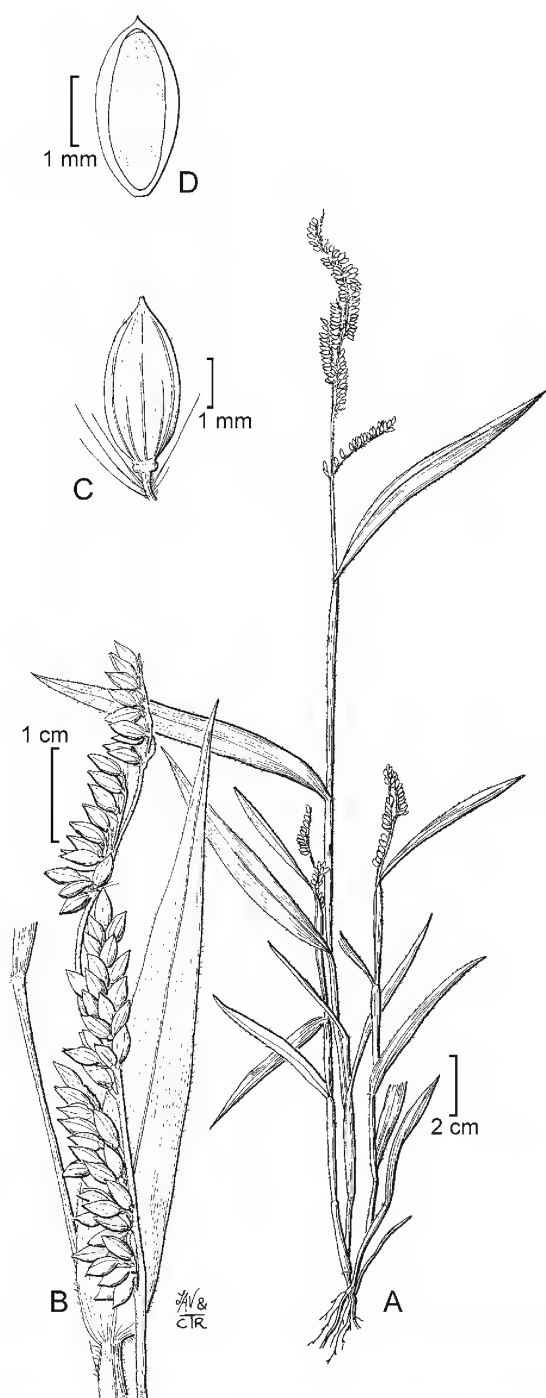


FIGURE 116. *Eriochloa lemmonii*. A. Habit. B. Inflorescence and leaf blade. C. Spikelet. D. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer 110-A* (US); Intersección Arroyo de Santiago con el Río Batopilas, 6 km antes del pueblo [before town] de Batopilas, 10 Sep 1999, 600 m, *T. Lebgue, G. Quintana & E. Estrada 2362* (NMC). **Bocoyna:** entre [between] barranca del Cobre & Bacahipare, bosque bajo de leguminosas [low legume forest], 17 Aug 1976, 1010 m, *J.M. Peña & S. González 728* (ENCB). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional "Cascada de Basaseachic," 18 km from the Cahuisori-Ocampo road on the road to Candamena, 7.5 km below Cruz, 24 Sep 1994, 1260 m, *Spellenberg, Corral & Estrada 12193* (NMC).

157. *Eriochloa nelsonii* Scribn. & J. G. Sm., Bull. Div. Agrostol. U.S.D.A. 4: 12–13. 1897.

Annual. Culms 30–150 cm tall, erect or decumbent, pubescent. Sheaths pilose; ligule 0.3–1.5 mm long, a ring of hairs; blades 7–19 cm long, 5–17 mm wide, flat, pilose. Inflorescence 6–12 cm long, 1.5–4 cm wide, main axis pilose, branches 1.2–3.5 cm long, (1)3–7(10) per culm with 10–40 spikelets per branch, divergent from rachis, the branches with hairs 3–8 mm long. Spikelets 5–8 mm long, 1.5–2 mm wide, lanceolate, in pairs; upper glumes equaling the lower lemmas, lanceolate, 5- to 9-veined, pilose, glabrous toward the apex, acute to obtuse, mucicous; lower lemma 4.8–7.8 mm long, 1.5–2 mm wide, lanceolate, 5(7)-veined, pilose, glabrous toward the apex, acute and mucicous; palea vestigial or absent; upper lemma 3.2–4.4 mm long, 5-veined, acute to rounded or acute with a small mucro.  $2n = 18, 36$ .

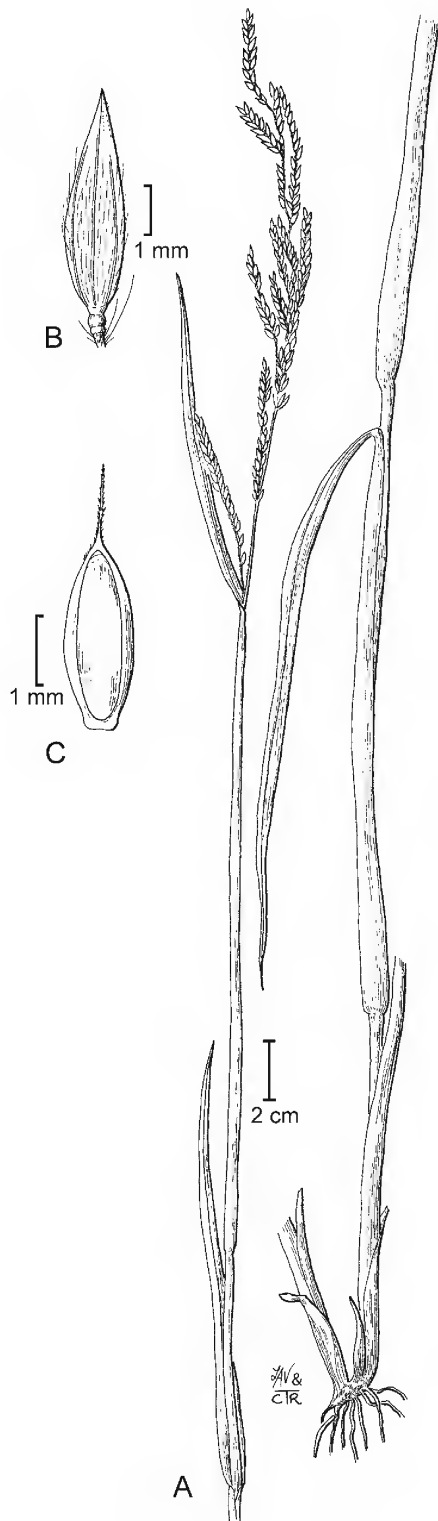
**DISTRIBUTION AND HABITAT.** *Eriochloa nelsonii* has two varieties; only *Eriochloa nelsonii* var. *nelsonii* is present in Chihuahua. It ranges from Mexico to Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

158. *Eriochloa punctata* (L.) Desv. ex Ham., Prodr. Pl. Ind. Occid. 5. 1825.

FIGURE 117

Perennial; rhizomatous, often flowering the first year and resembling an annual. Culms 30–150 cm tall, erect or decumbent, not rooting at the lower nodes; internodes glabrous; nodes 3–10, glabrate. Sheaths occasionally inflated, glabrous (rarely puberulent), often purplish at maturity; ligules 0.4–1 mm long; blades 10–50 cm long, (2)4–10(13) mm wide, linear, flat, straight, spreading, glabrous (rarely puberulent) on both surfaces. Panicles 9–22 cm long, 1–10 cm wide, contracted, rarely open; rachises scabrous to densely pubescent; branches (4)8–20(27), 1–6 cm long, 0.3–0.5 mm wide, appressed or divergent, glabrous, not winged, with 28–60 spikelets, spikelets mostly in unequally pedicellate pairs, solitary distally; pedicels 0.1–0.7 mm long, uniformly pubescent, hairs about 0.1 mm. Spikelets (4)4.5–5.7 mm long, 0.9–1.4 mm wide; upper glumes equaling the lower lemmas,



lanceolate, sparsely appressed pilose, 5- to 7-veined, acuminate, sometimes mucronate, mucro shorter than 0.5 mm; lower lemmas 4.3–5.5 mm long, 0.9–1.4 mm wide, lanceolate, setose, 5- to 7-veined, acuminate, unawned or mucronate; lower paleas absent; anthers absent; upper lemmas 2–3.5 mm (excluding the awn), 0.4–0.6 times as long as the lower lemmas, indurate, elliptic, 5-veined, rounded, awned, awns 0.6–1.5 mm long; upper paleas 0.5–1.2 mm long, indurate, blunt.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Eriochloa punctata* grows in coastal marshes, along water courses, and in moist swales and ditches of the coastal plain from Texas and Louisiana south through Mexico to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Camargo:** 20 km S of Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1385 (ENCB, US); 5 km W of Cd. Camargo, 5 Aug 1939, *L. H. Harvey* 1416 (US). **Gran Morelos:** 4 mi E of General Trias, 14 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3462 (US). **Valle de Zaragoza:** 58 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, grassland, 1500 m, *P.M. Peterson & Annable* 8097 (US).

### *Erioneuron* Nash

Perennial; usually caespitose, occasionally stoloniferous. Culms 6–65 cm long, erect. Leaves mostly basal; sheaths smooth, glabrous, striate, margins hyaline, collars with tufts of 1–3 mm hairs; blades usually folded, pilose basally, margins white, cartilaginous, apex acute but not sharp. Inflorescences terminal, simple panicles (racemes in depauperate specimens), exserted well above the leaves. Spikelets laterally compressed, with 3–20 florets, distal florets staminate or sterile; disarticulation above the glumes and between the florets. Glumes thin, membranous, 1-veined, acute to acuminate; calluses with hairs; lemmas rounded on the back, 3-veined, veins conspicuously pilose, at least basally, apex toothed or obtusely 2-lobed, midveins often extended into awns, awns to 4 mm long, lateral veins sometimes extended as small mucros; paleas shorter than the lemmas, keels ciliate, intercostal regions pilose basally; lodicules 2, adnate to the bases of the paleas; anthers 1 or 3. Caryopsis glossy, translucent; embryos more than  $\frac{1}{2}$  as long as the caryopsis.  $x = 8$ .

*Erioneuron* is an American genus of three species, all in Chihuahua.

**FIGURE 117.** *Eriochloa punctata*. A. Habit. B. Spikelet. C. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



KEY TO SPECIES OF *ERIONEURON*

1. Lemmas 2-lobed, with a cleft of 1–2.5 mm deep, central veins extended into an awn 1–4 mm long; glumes (at least the upper) as long as or longer than the inferior florets.
  2. Lemma lobes obtuse to broadly acute, 1–2 mm deep; lateral veins never excurrent into small mucros; plants tufted, 10–40 cm tall ..... *E. avenaceum*
  2. Lemma lobes rounded to truncate, 1.5–2.5 mm deep; lateral veins of lemma excurrent into small mucros up to 1 mm long; plants generally taller, 25–65 cm tall ..... *E. nealleyi*
1. Lemmas entire, without a cleft or if present, only 0.1–0.5 mm deep; central veins extended into a small awn 0.5–2(2.5) mm long; glumes shorter than the inferior florets ..... *E. pilosum*

159. *Erioneuron avenaceum* (Kunth) Tateoka, Amer. J. Bot. 48(7): 572. 1961. *Triodia avenacea* Kunth, Nov. Gen. Sp. (quarto ed.)1: 156. T. 48. 1815. *Tridens avenaceus* (Kunth) Hitchc., Contr. U.S. Natl. Herb. 17(3): 357. 1913.

*Erioneuron avenaceum* var. *grandiflorum* (Vasey) Gould.

FIGURE 118

Culms (7)10–30(40) cm tall, (0.4)0.7–1 mm thick, glabrous; nodes glabrous or villous. Ligules to 0.5 mm long; blades (1.5)3–5(8) cm long, (0.5)1–1.5(2.5) mm wide, both surfaces sparsely pilose. Panicles 2–8(10) cm long; branches with 2–10(16) shortly pedicellate spikelets. Spikelets 6–8(10) mm long, purplish, with (4)6–12(20) florets; lower glumes 4–7 mm long; upper glumes 6–9 mm long, equaling or exceeding the lowest florets; lemmas 4–7 mm long, purplish-green, awned from between the lobes, awns 2–4 mm long, apex bilobed, lobes 1–2 mm long, obtuse to acute; anthers 0.4–1 mm long or (when monandrous) to 1.3 mm long. Caryopsis 1–1.4 mm long.  $2n = 16, 32$ .

**DISTRIBUTION AND HABITAT.** *Erioneuron avenaceum* var. *avenaceum* is common in rocky areas from the southwestern United States to central Mexico; it also grows in Bolivia and Argentina.

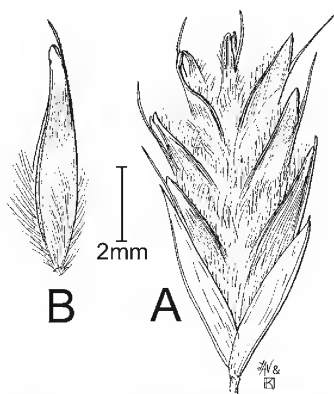


FIGURE 118. *Erioneuron avenaceum*. A. Spikelet. B. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** 17 (rd) mi NE of Aldama along Hwy 16 at Puerto de Gómez, 14 Sep 1972, 1450 m, J. Henrikson 7543 (MEXU, NMC); 4 km (airline) SE of Placer de Guadalupe, 23 Oct 1972, matorral desértico [desert scrub], 1500 m, F. Chiang, T. Wendt & M.C. Johnston 9851A (MEXU). **Ascensión:** Sierra de Bismarck, 21 Aug 1972, 1500–1850 m, F. Chiang, T. Wendt & M.C. Johnston 8765 (MEXU). **Chihuahua:** near Chihuahua, 12 Aug 1885, C.G. Pringle s.n. (US). **Hidalgo del Parral:** 4 mi E of Parral, 13 Sep 1960, Reeder & C. Reeder 3458 (US); 14 mi E of Parral, 6 Sep 1967, Reeder & C. Reeder 4876 (ARIZ, US). **Jiménez:** Santa Eulalia, 12 Aug 1885, Limestone ledges, C.G. Pringle 406 (MEXU, US); 1885, E. Wilkinson s.n. (US). **Matamoros:** 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 1900 m, P.M. Peterson, Annable & Valdés-Reyna 10871 (US).

160. *Erioneuron nealleyi* (Vasey) Tateoka, Amer. J. Bot. 48(7): 572. 1961. *Triodia nealleyi* Vasey, Bull. Torrey Bot. Club 15: 49. 1890.

FIGURE 119

Culms (15)30–65 cm tall, 0.8–2 mm thick, glabrous or hirsute; nodes glabrous or densely villous. Ligules 0.2–0.6 mm long; blades 5–10 cm long, 2–2.5 mm wide, flat in moist conditions, both surfaces pilose to villous, green. Panicles compact (rarely

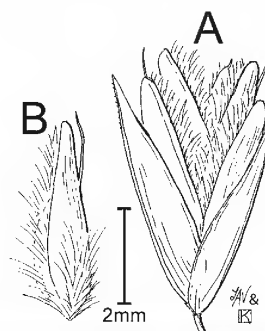


FIGURE 119. *Erioneuron nealleyi*. A. Spikelet. B. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.



open), 5–10 cm long, 1–3 cm wide, usually 2–4(6) times longer than wide, occasionally interrupted in the lower  $\frac{1}{2}$ ; branches with 5–17 shortly pedicellate spikelets. Spikelets 7–11 mm long, purplish to pale, with 3–15 florets; lower glumes 5–7 mm; upper glumes 6–9 mm long, generally equaling or exceeding the lowest florets; lemmas 4–6 mm long, awned from between the lobes, awns 1–3.5 mm long, apex bilobed, lobes 1.5–2.5 mm long, rounded to truncate, lateral veins forming a mucro to 1 mm long; anthers 1, 1–1.5 mm long. Caryopsis 1.3–1.5 mm long.  $2n = 16$ .

**DISTRIBUTION AND HABITAT.** *Erioneuron nealleyi* is found on rocky slopes in the southwestern United States and central Mexico. Stoloniferous plants are known only from central Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aguiles Serdán:** Camino a Santa Eulalia–San Guillermo, 30 Aug 1996, matorral xerófilo [xerophilous scrub], 1500 m, *E. Estrada & C. Yen 5783* (CIIDIR). **Hidalgo del Parral:** 4 mi E of Parral, 13 Sep 1960, 5700 ft, *Reeder, C. Reeder & Soderstrom 3458* (ARIZ, ENCB). **Jiménez:** N end of Sierra de las Pampas on road from Las Pampas NW to Camargo, 24 Aug 1972, matorral desértico [desert scrub], 1400 m, *M.C. Johnston, T. Wendt & F. Chiang 8803* (MEXU).

161. *Erioneuron pilosum* (Buckley) Nash, Fl. S.E. U.S. 144: 1327, 1903. *Uralespis pilosa* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 94, 1862.

FIGURE 120

Culms (6)10–30(40) cm tall, (0.3)0.6–1(2.5) mm thick, glabrous or hirsute. Ligules 2–3.5 mm long; blades (1)3–6(9) cm long, (0.5)1–1.5(2.5) mm wide, both surfaces sparsely pilose or glabrous, grayish-green. Panicles 1–4(6) cm long; branches with 3–9 shortly pedicellate spikelets. Spikelets 6–12(15) mm long, with (5)6–12(20) florets; glumes exceeded by the lowest florets, pale; lower glumes 4–7 mm long; upper glumes 4–7 mm long; lemmas 3–6 mm long, green or purplish-green when young, becoming stramineous at maturity, awned, awns 0.5–2.5 mm long, apex acute, entire or bidentate, teeth 0.3–0.5 mm long; stamens usually 3, anthers 0.3–1 mm long. Caryopsis 1–1.5 mm long.  $2n = 16$ .

**DISTRIBUTION AND HABITAT.** *Erioneuron pilosum* grows on dry, rocky hills and mesas, often in oak and pinyon–juniper woodlands. In North America, it is represented by *Erioneuron pilosum* var. *pilosum*. This variety differs from the other two varieties, both of which are restricted to Argentina, in its longer, less equal glumes and shorter awns.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Samples not seen during the present revision but reported in Espejo Serna et al. (2000).

### *Festuca* L. [*Vulpia* C. C. Gmel.]

Perennial and annual; bisexual; usually densely to loosely caespitose, with or without rhizomes, occasionally stoloniferous. Culms usually glabrous and smooth throughout, sometimes

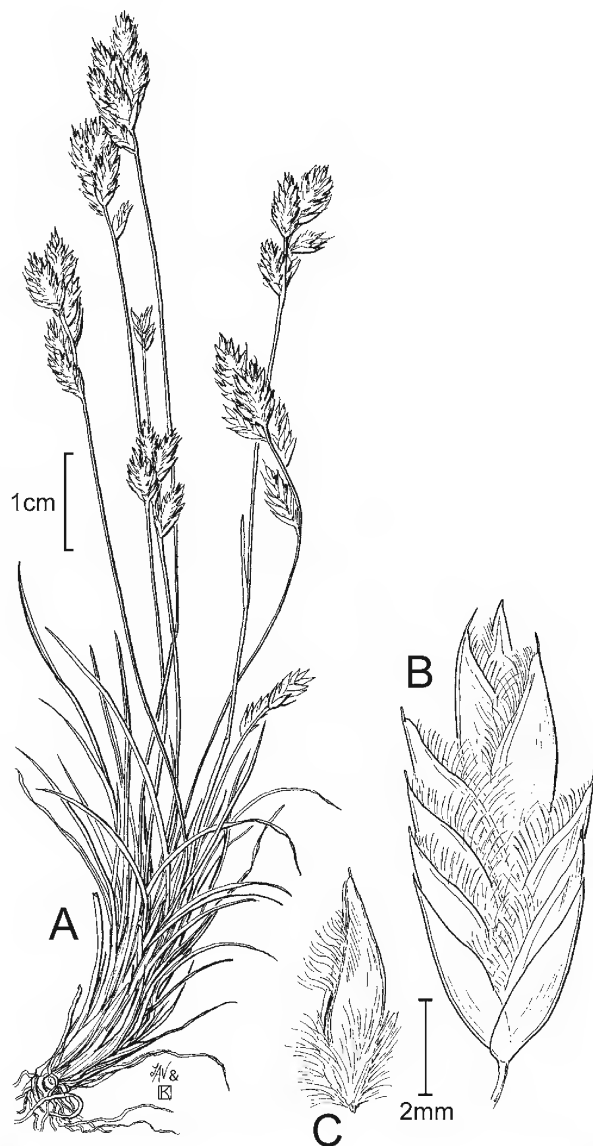


FIGURE 120. *Erioneuron pilosum*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

scabrous or densely pubescent below the inflorescences. **Sheaths** from open to the base to closed almost to the top, in some species sheaths of previous years persisting and the blades usually deciduous, in other species the senescent sheaths rapidly shredding into fibers and decaying between the veins and the blades not deciduous; **collars** inconspicuous or absent, usually glabrous; **ligules** membranous, truncate to acute, ciliate to erose; **blades** flat, conduplicate, involute, or convolute, sometimes glaucous or pruinose, glabrous

or scabrous, sometimes hirsute or puberulent. **Inflorescences** open or contracted panicles, sometimes reduced to racemes, usually with 1–2(3) branches at the lower nodes. **Spikelets** with (1)2–10 mostly bisexual florets, distal florets reduced or abortive; **disarticulation** above the glumes, beneath the florets. **Glumes** subequal or unequal, usually exceeded by the florets, ovate to lanceolate, acute to acuminate; **lower glumes** from shorter than to about equal to the adjacent lemmas, 1(3)-veined; **upper glumes** 3(5)-veined; **lemmas** usually chartaceous, sometimes coriaceous, bases more or less rounded dorsally, slightly or distinctly keeled distally, veins

5(7), prominent or obscure, apex acute to attenuate, sometimes minutely bidentate, usually terminally or subterminally awned or mucronate; **paleas** from shorter than to slightly longer than the lemmas, veins sparsely to densely scabrous-ciliate, bidentate; **anthers** 1 or 3. **Caryopsis** obovoid-oblong, adaxially grooved, usually free of the lemmas and paleas, sometimes adhering along the groove, sometimes adhering more broadly.  $x = 7$ .

*Festuca* is a widespread genus, with about 610 species (Soreng et al., 2017b). The species grow in alpine, temperate, and polar regions on all continents except Antarctica.

#### KEY TO SPECIES OF *FESTUCA*

1. Plants annual.
  2. Lower glumes less than  $\frac{1}{2}$  the length of the upper glumes; spikelets 5–12 mm long, with 3–7 florets; rachilla internodes 0.75–1(1.9) mm; lemma awns 5–15(22) mm long ..... *F. myuros*
  2. Lower glumes  $\frac{1}{2}$  or more the length of the upper glumes; spikelets 4–10(13) mm long, with (4)5–11(17) florets; rachilla internodes 0.5–0.7 mm long; lemma awns 0.3–9 mm long ..... *F. octoflora*
1. Plants perennial.
  3. Leaf blades flat, occasionally conduplicate, 5–15(18) mm wide; lemmas awned.
    4. Lemma awn 0.5–4 mm long; ligules 2.5–7 mm long ..... *F. lugens*
    4. Lemma awn 1–2 mm long; ligules 0.8–1.1(2) mm long ..... *F. amplissima*
  3. Leaf blades 1–2.5(3) mm wide, permanently enrolled or involute, when flat no wider than 3 mm; lemmas unawned to short-awned.
    5. Lemma apex bidentate, sometimes only emarginate, lemma awn 0.5–3(3.7) mm long, emerging between the teeth or emerging a little lower than the apex when emarginate; ligules 1.5–3.2(4.6) mm long ..... *F. tolucensis*
    5. Lemma apex entire, unawned or awned emerging in the apex; ligules 0.5 mm long.
      6. Plants loosely caespitose, often with short rhizomes; culms decumbent, much branched near the base; sheaths margins closed up to halfway; lemmas awned, awns 2–3 mm long ..... *F. rubra*
      6. Plants densely caespitose, lacking rhizomes; culms erect, unbranched near the base; sheath margins closed up to  $\frac{1}{3}$  of the way from the base; lemmas unawned or apically mucronate, the mucro less than 1 mm long.
        7. Anthers in the lowest floret usually abortive, anthers from the upper florets well-developed, 3–4.2 mm long ..... *F. dichla*
        7. Anthers in the lowest floret not abortive, all anthers approximately the same length, 1.6–6 mm long.
          8. Leaf blades always folded (conduplicate or convolute), 0.5–1 mm wide, with 5–7(9) veins; panicle branches erect to spreading; apex of ovaries glabrous ..... *F. rosei*
          8. Leaf blades flat to loosely folded, 2.5–3 mm wide, with 9–11 veins; panicles branches lax and loosely spreading, divaricate, basally naked and with the spikelets toward the apex; apex of ovaries pilose .... *F. pringlei*

162. *Festuca amplissima* Rupr. ex Fourn., Mex. Pl. 2: 125. 1881.

FIGURE 121

Perennial; strong. Culms 110–150 cm tall, erect, not branched, with the base hardened, nodes obscure. Leaves basal, numerous; sheaths fibrous, slightly scabrous, ligules 0.5–1.8 mm long, membranous, the basal very short; blades 20–50 cm long, 7–8 mm wide, stiff and erect, scabrous, apex attenuate to involute. Panicle solitary, terminal, exerted to 40 cm long, narrowly elliptic; branches up to 5 per node, 10–12 cm long, ascending, naked several centimeters near the base, rachis, branches, and angular pedicels scabrous on the margins. Spikelets 8.5–10 mm long, laterally compressed, plicate along the branches, pedicels generally short; lower glumes 3–4.5 mm long, linear, 1-veined, upper glume 4.8–6 mm long, 3-veined, lanceolate; florets 3–5,

often with a short terminal rudiment; lemmas 5.5–7 mm long, lanceolate, scabrous, 5-veined, keeled, unawned, acuminate, often purple over the back, bronzing near the apex; paleas almost as long as the lemmas, exerted abruptly to a point, scabrous between the keels; rachilla slender, scabrous; stamens 3, anthers 2.0–2.8 mm long, purple.

**DISTRIBUTION AND HABITAT.** *Festuca amplissima* is a rare species known only from clearings in forests with *Pinus* and *Quercus*. It is reported from Mexico, Central America, and South America (Stančik and Peterson 2007).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Canyons of the Sierra Madre, 16 Sep 1887, C.G. Pringle 1438 (MEXU) Isotype. **Guachochi:** Steep slopes above Barranca Basihuare, 28 Aug 2003, forest with oaks and pines, 1815 m, P.M. Peterson & P. Catalán 17573 (US).

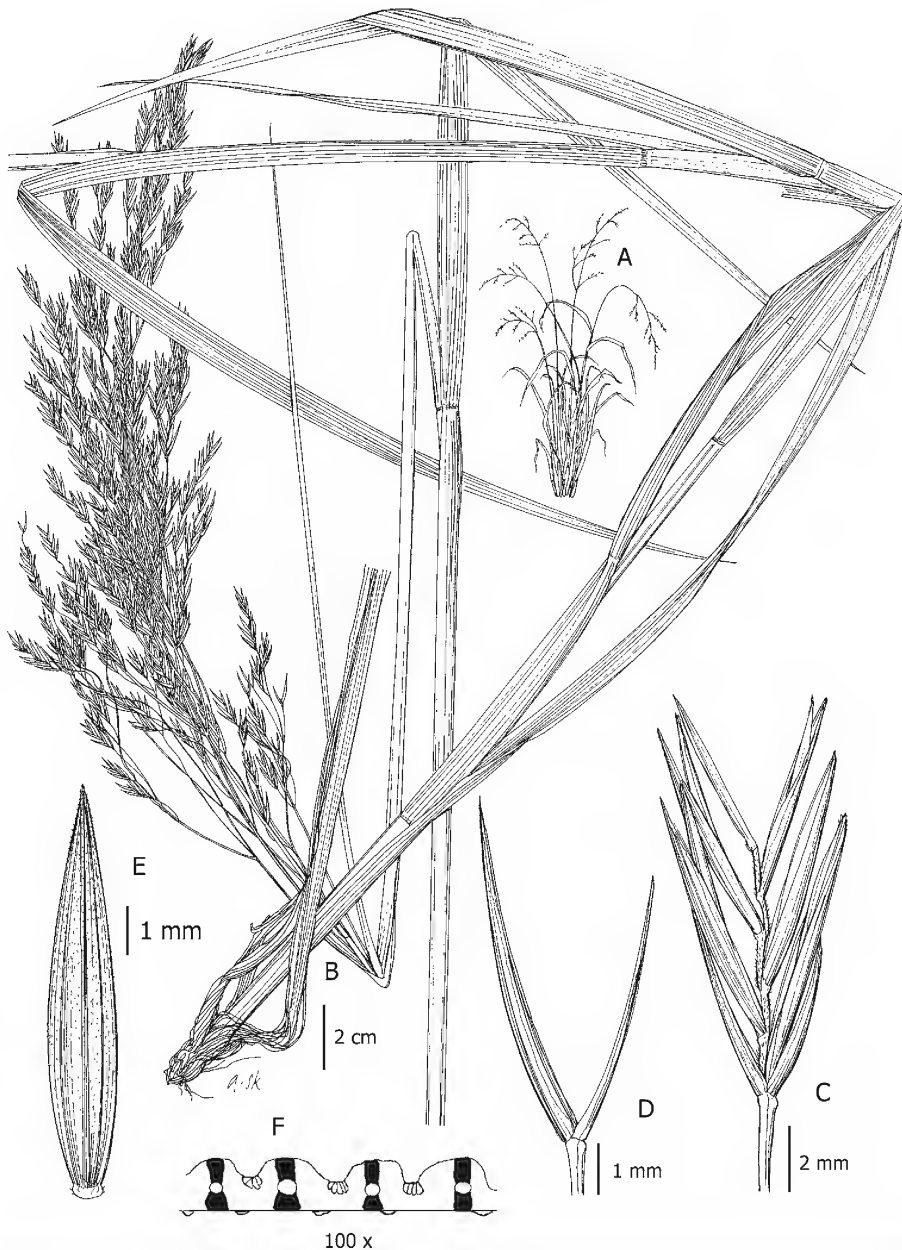


FIGURE 121. *Festuca amplissima*. A. Stylized growth form. B. Habit. C. Spikelet. D. Glumes. E. Lemma. F. Leaf blade cross-section. Drawn by Anna Skoumalová for Smithsonian Institution, Department of Botany.

163. *Festuca diclina* Darbysh., Novon 5(2): 129, f. 1A–F, 2A–C. 1995.

Perennial; delicate, densely caespitose, without rhizomes. Culms 30–90 cm long, erect, light green, with black or brown nodes, glabrous, not branched from base. Sheaths fibrous when

mature, margins closed less than  $\frac{1}{3}$  from the base; ligules 0.2–0.5 mm long, acute to truncate, sometimes lacerate, sparsely retrorse-scabrous; blades 1.2–1.5 mm wide (in the flat part), permanently inrolled or involute. Panicles 8–15 cm long, pyramidal, branches a little flexuous or sinuose-undulate, 1 or 2 per

node, glabrous to sparsely scabrous in the angles, the inferior 5–9 cm long. Spikelets 8–12 mm long, in the distal part of the branches with (2)3–4(5) florets; glumes ovate-lanceolate, the margin hyaline and wide, glabrous to scabrous over the keels (apically), lower glumes 2.4–4 mm long, 1-veined, upper glumes 3.5–5 mm long, (1)3-veined, rachilla with hairs of 0.1–0.3 mm; lemmas 6–8 mm long, narrowly lanceolate, glabrous or apically scabrous-hirsute, 1- to 3(5)-veined, apex entire, unawned or with a small mucro to 1 mm; paleas 5.5–7 mm long, 2-toothed, apically pilose-hirsute, hairs 0.1–0.2 mm long; anthers of the most inferior floret usually abortive, anthers of the upper florets 3–4.2 mm long, well-developed.

**DISTRIBUTION AND HABITAT.** *Festuca diclina* is endemic to Chihuahua and is found on steep, rocky, volcanic slopes with *Pinus*, *Quercus*, *Arctostaphylos*, and *Picea* at 2,620–3,300 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 61.3 km W of Balleza and 33.8 km E of Guachochi, 2620 m, 18 Sep 1991, P.M. Peterson, C.R. Annable & J. Valdés Reyna 10774 (US). **Guadalupe y Calvo:** Summit of Sierra Mohinora, 16 Oct 1959, Correll & Gentry 23178 (US); N side of Cerro Mohinora, ca. 13 mi SW of Guadalupe y Calvo, 20 Aug 1988, Open pine-fir Woods with scattered spruce, 2950 m, G. Neson & A. Mc Donald 6473 (MEXU); Cerro Mohinora, rocks on the NW side of the hill top, 3 Nov 2007, *Juniperus*, Type locality, 3290 m, D. Stancik & S. González 6188, 6189 (MEXU); Sierra Mohinora, 13 Sep 2006, bosque de pino [pine forest], 3076 m, P.M. Peterson, F. Sánchez Alvarado & E.P. Gómez Ruíz 20051 (CIIDIR).

**163. *Festuca lugens*** (E. Fourn.) Hitchc. ex Hern.-Xol., Bol. Soc. Bot. México 23: 165. 1958. *Uniola lugens* E. Fourn., Mexic. Pl. 2: 123. 1886.

*Festuca mirabilis* Piper.

Perennial; densely tufted with extravaginal innovations and rhizomes not elongated. Culms 100–200 cm tall, glabrous. Sheaths scabrous, straw color, not fibrous, margins free, auricles absent; ligule 2.5–7 mm long, ciliolate; blades 50–80 cm long, 3–6 mm wide, flat or folded, scabrous. Panicles 20–30 cm long, 5–10 cm wide, spread, lax; axis basally glabrous, apically scabrous, inferior branches 8–18 cm long, generally paired, widely spreading, naked in the inferior ½; pedicels scabrous. Spikelets 15–20 mm long, with 5–7 florets; lower glumes 5.5–8 mm long, subulate, 1-veined, upper glumes 8–10 mm long; lemmas 12–15 mm long, scabrous, 2-toothed, with awns 1–4 mm long, scabrous; anthers 3.8–5.5 mm long; ovary glabrous.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Festuca lugens* grows in open areas of *Pinus-Quercus* forests. It is a Mexican species known from Chiapas, Chihuahua, Guanajuato, Hidalgo, Jalisco, México, Morelos, Nayarit, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7683 (US).

**164. *Festuca myuros***\* L., Sp. Pl. 1: 74–75. 1753. *Vulpia myuros* (L.) C. C. Gmel., Fl. Bad. 1: 8. 1805.

**Annual.** Culms 10–75(90) cm tall, solitary or loosely tufted, branched or unbranched distally. Sheaths usually glabrous; ligules 0.3–0.5 mm long; blades 2.4–10.5(17) cm long, 0.4–3 mm wide, usually rolled, occasionally flat, usually glabrous. Inflorescences 3–25 cm long, 0.5–1.5(2) cm wide, dense panicles or spikelike racemes, with 1 branch per node, often partially enclosed in the uppermost sheaths at maturity, pulvini absent; branches spreading or appressed to erect. Spikelets 5–12 mm long with 3–7 florets; rachilla internodes 0.75–1(1.9) mm long; glumes glabrous; lower glumes 0.5–2 mm long, ½–½ the length of the upper glumes; upper glumes 2.5–5.5 mm long; lemmas 4.5–7 mm long, 5-veined, usually scabrous distally, glabrous except the margins sometimes ciliate, apex entire, awned, the awns 5–15(22) mm long; paleas 4.7–6.4 mm long, minutely bifid; anthers 0.5–1(2) mm long. Caryopsis 3–5 mm long, fusiform, glabrous.  $2n = 14, 42$ .

**DISTRIBUTION AND HABITAT.** *Festuca myuros* grows in well-drained, sandy soils and disturbed sites. It is native to Europe and North Africa and once thought to be native to North America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Práxedes G. Guerrero:** Sierra San Ignacio, 7.5 km al W de Col. Esperanza, 18 Mar 1995, en lecho [bed] de arroyo, 1190 m, R. Corral, P. Olivas & E. Pérez RCD6042 (UACJ).

**165. *Festuca octoflora*** Walter, Fl. Carol. 81. 1788. *Vulpia octoflora* (Walter) Rydb., Bull. Torrey Bot. Club 36: 538. 1909.

FIGURE 122

**Annual.** Culms 5–60 cm tall, solitary or loosely tufted, glabrous or pubescent. Sheaths glabrous or pubescent; ligules 0.3–1 mm long; blades to 10 cm long, 0.5–1 mm wide, flat or rolled, glabrous or pubescent. Panicles 1–7(20) cm long, 0.5–1.5 cm wide, with 1–2 branches per node; branches appressed to spreading. Spikelets 4–10(13) mm long, with (4)5–11(17) florets; rachilla internodes 0.5–0.7 mm long; lower glumes 1.7–4.5 mm long, ½–¾ the length of the upper glumes; upper glumes 2.5–7.2 mm long; lemmas 2.7–6.5 mm long, 5-veined, smooth, scabrous, or pubescent, apex entire, no more pubescent than the bases, awns of the lowermost lemma in each spikelet 0.3–9 mm long; paleas slightly shorter than the lemmas, apex entire or minutely bifid, teeth shorter than 0.2 mm long; anthers 0.3–1.5 mm long. Caryopsis 1.7–3.7 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Festuca octoflora* is a widespread native species growing in grasslands, sagebrush, and open woodlands, as well as in disturbed habitats and areas of secondary succession, such as old fields, roadsides, and ditches. It is known from United States to Mexico in Baja California, Baja California Sur, and Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Cerca del Río Chih., 7 Abr [Apr] 1886, C.G. Pringle s/n (MEXU). **Janos:** Ca. 8.2 km (by road), Sierra de Cal (La



FIGURE 122. *Festuca octoflora*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

Biznaga), 25 Mar 2007, Chihuahuan desert scrub, A.L. Reina & T.R. Van Devender 2007-307 (ARIZ).

166. *Festuca pringlei* St.-Yves, Candollea 2: 305. 1925.

Perennial; caespitose, not rhizomatous. Culms to 1.5 m tall, glabrous, erect, unbranched from the base. Leaves of 2 forms, the basal convolute, filiform, the cauline flat and involute toward the apex; basal sheaths fibrous, disintegrated at maturity, sheaths margin closed less than  $\frac{1}{3}$  from the base, lacking auricles; ligules 0.5 mm long, membranous and pilose; blades 20–30 cm long, 2.5–3 mm wide, flat to loosely folded with 9–11 veins. Panicles 15–22 cm long, lax and loosely spreading, divaricate, basally naked and with the spikelets toward the apex. Spikelets 10–15 mm long, with 4–5 flattened florets, widely spaced; glumes glabrous and apiculate; lower glumes 4–4.5 mm long; upper glumes 5–6.5 mm long, wider; lemma 6.5–8 mm long, smooth on the back, apex entire, unawned or with an apical mucro, less than 1 mm; palea equal or less than lemma; anthers 1.6–6 mm long from the inferior florets, not abortive, all about equal; ovaries pilose toward the apex.

**DISTRIBUTION AND HABITAT.** *Festuca pringlei* is an uncommon species that grows in pinyon forests; it is a Mexican species known from Aguascalientes, Chihuahua, Durango, and Jalisco.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** Mt. Mohinora, SW Chihuahua, 2820 m, 1 Sep 1898, E.W. Nelson 4900 (US); near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson, F. Sánchez Alvarado & E.P. Gómez Ruíz 20046 (CIIDIR, US).

167. *Festuca rosei* Piper, Contr. U.S. Natl. Herb. 10: 45. 1906.

Perennial; caespitose, not rhizomatous. Culms 70–150 cm tall, glabrous, the culms several or many together. Sheaths persistent with shredded bases below; ligules 0.3–0.6 mm long, ciliolate; blades (10)20–40 cm long, 0.5–1 mm wide, filiform, tightly involute, terete or angled, margins scabrous with 5–7(9) prominent veins on the upper surface. Panicles 15–30 cm long, 2–5 cm wide with erect to spreading branches 3–5(10) cm long inserted solitary at a node. Spikelets (7)9–12 mm long, 3- to 6-flowered; glumes 3–7 mm long; lower glumes 3–4.5(5.5) mm long, 1-veined, subulate; upper glumes 4–7 mm long, 3-veined, wider than lower; lemmas (5.7)6–7 mm long, subulate, glabrous, margins involute, apex scabrous sometimes mucronate; paleas a little shorter or longer than the lemma, apex bifid; anthers (2.7)3–4 mm long, yellow; apex of ovaries glabrous.

**DISTRIBUTION AND HABITAT.** *Festuca rosei* occurs on steep, rocky, volcanic slopes with *Pinus*, *Quercus*, and *Arctostaphylos* at 2,500–3,100 m. This is the first report of *F. rosei* from Chihuahua, a species known from throughout western Mexico to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 61.3 km W of Balleza and 33.8 km E of Guachochi, 2620 m, P.M. Peterson, Annable & Valdés-Reyna 10775 (US).



168. *Festuca rubra* L., Sp. Pl. 1: 74. 1753.

FIGURE 123

**Perennial**; usually rhizomatous and loosely to densely caespitose, culms sometimes single and widely spaced, sometimes stoloniferous. **Culms** (8)10–120 (130) cm tall, erect or decumbent, glabrous and smooth. **Sheaths** closed for about  $\frac{3}{4}$  their length when young, readily splitting with age, usually pubescent, at least distally, hairs retrorse or antrorse, sometimes glabrous, not persistent, older vegetative shoot sheaths shredding into fibers; **collars** glabrous; **ligules** 0.1–0.5 mm long; **blades** usually conduplicate or convolute and 0.3–2.5 mm in diameter, sometimes flat and 1.5–7 mm wide, abaxial surfaces glabrous, smooth or scabrous, adaxial surfaces scabrous or pubescent, veins 5–9(13), ribs (3)5–7(9), usually conspicuous. Panicles (2)3.5–25(30) cm long, usually open or loosely contracted panicles, occasionally racemes, with 1–3 branches per node, lower branches with 2 or more spikelets; **branches** erect or spreading, stiff or lax, glabrous, scabrous, or pubescent. **Spikelets** (6)7–17 mm long, with 3–10 florets; **glumes** ovate-lanceolate to lanceolate, exceeded by the distal florets; **lower glumes** (1.5)2–6(7) mm long; **upper glumes** (3)3.5–8.5 mm long; **lemmas** 4–9.5 mm long, usually glabrous

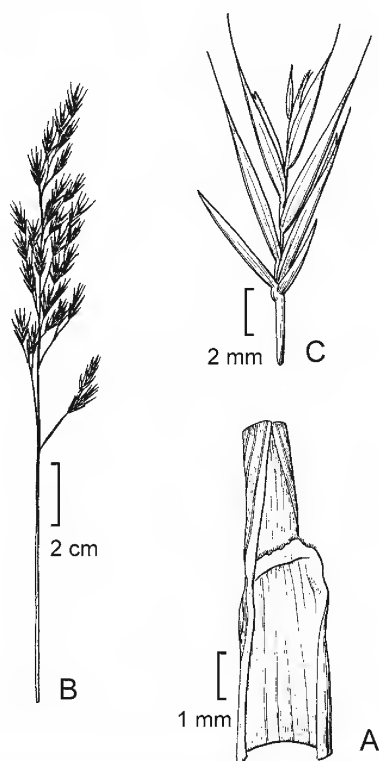


FIGURE 123. *Festuca rubra*. A. Ligule. B. Inflorescence. C. Spikelet. Drawn by Cindy Roché; copyright Utah State University.

and smooth, sometimes scabrous toward the apex, sometimes densely pubescent throughout, attenuate or acuminate in side view, awned, awns (0.1)0.4–4.5 mm long; **paleas** slightly shorter than to about equaling the lemmas, intercostal region puberulent distally; **anthers** 1.8–4.5 mm long; **ovary apex** glabrous.  $2n = 28$ , 42, 56, 70.

**DISTRIBUTION AND HABITAT.** *Festuca rubra* is interpreted here as a morphologically diverse polyploid complex that is widely distributed in the arctic and temperate zones of Europe, Asia, and North America to Mexico, where it is known from Chihuahua, Coahuila, Distrito Federal, Durango, México, Nuevo León, Puebla, Querétaro, Tamaulipas, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Madera:** Sierra Madre near Col. Garcia, 5 Jul 1899, bosque de encino [oak forest], 2300 m, C.H.T. Townsend & F.L. Scribner s.n. (NMC, US). **Ocampo:** Parque Nacional Cascada de Basaseachic, within barranca [canyon], 25 Jun 1991, 2000 m, M. Mahrt & Spellenberg 124 (NMC); Parque Nacional Cascada de Basaseachic, ca. 130 air km W of Cuauhtemoc, along river at base of falls, 25 Abr [Apr] 1987, 1600 m, Spellenberg, Muldavin & Corral 9057 (NMC); Parque Nacional Cascada de Basaseachic, at base falls, 26 Abr 1985, 1570 m, Spellenberg, R. Soreng & R. Corral 8020 (MEXU, NMC); Parque Nacional Cascada de Basaseachic, ca. 130 air km W of Cuauhtemoc, 25 Jun 1991, 1600 m, Spellenberg & P. Martin 10793 (NMC); Parque Nacional Cascada de Basaseachic, 26 Abr 1985, 1570 m, R. Spellenberg, Soreng, R. Corral, J. Cornelius, C. Spurrier & T. Todsén 8020 (MEXU).

169. *Festuca tolucensis* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 153. 1815.

FIGURE 124

**Perennial**; caespitose, forming dense tufts. Culms 60–100 cm tall, erect, not branched, nodes obscure, contracted, internodes glabrous, leaves mainly basal; sheaths glabrous, rugose-granular; ligule 1.5–3.2(4.6) mm long, slender, membranous, blades 18–25 cm long, 1–2.5 mm wide, scabrous, permanently inrolled or involute, if flat no more than 3 mm wide, scaberulous, superior portion of culms almost leafless. Inflorescence solitary, terminal, exserted to 30 cm long, panicles 11–20 cm long, spread but narrow, sparsely floreted, branches in pairs or solitary. Spikelets 9–14 cm long, usually purple, florets 6–8; lower glumes 4.5–6.3 mm long, narrowly triangular, 1-veined, upper glumes 6–7.4 mm long, ovate, acute, 3-veined; lemma 6–8 mm long, narrowly ovate, lemma apex 2-toothed, sometimes only emarginate, lemma awn 0.5–3(3.7) mm long, arising between the tooth or a little below the apex when emarginate, scaberulous; palea slightly shorter, 2-toothed in the apex; stamens 3, anthers 2.8–3.4 mm long, yellow.

**DISTRIBUTION AND HABITAT.** *Festuca tolucensis* is known from Mexico, Central America, and South America

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 8 km al W de Cabóachi, 12 Aug 1982, bosque de

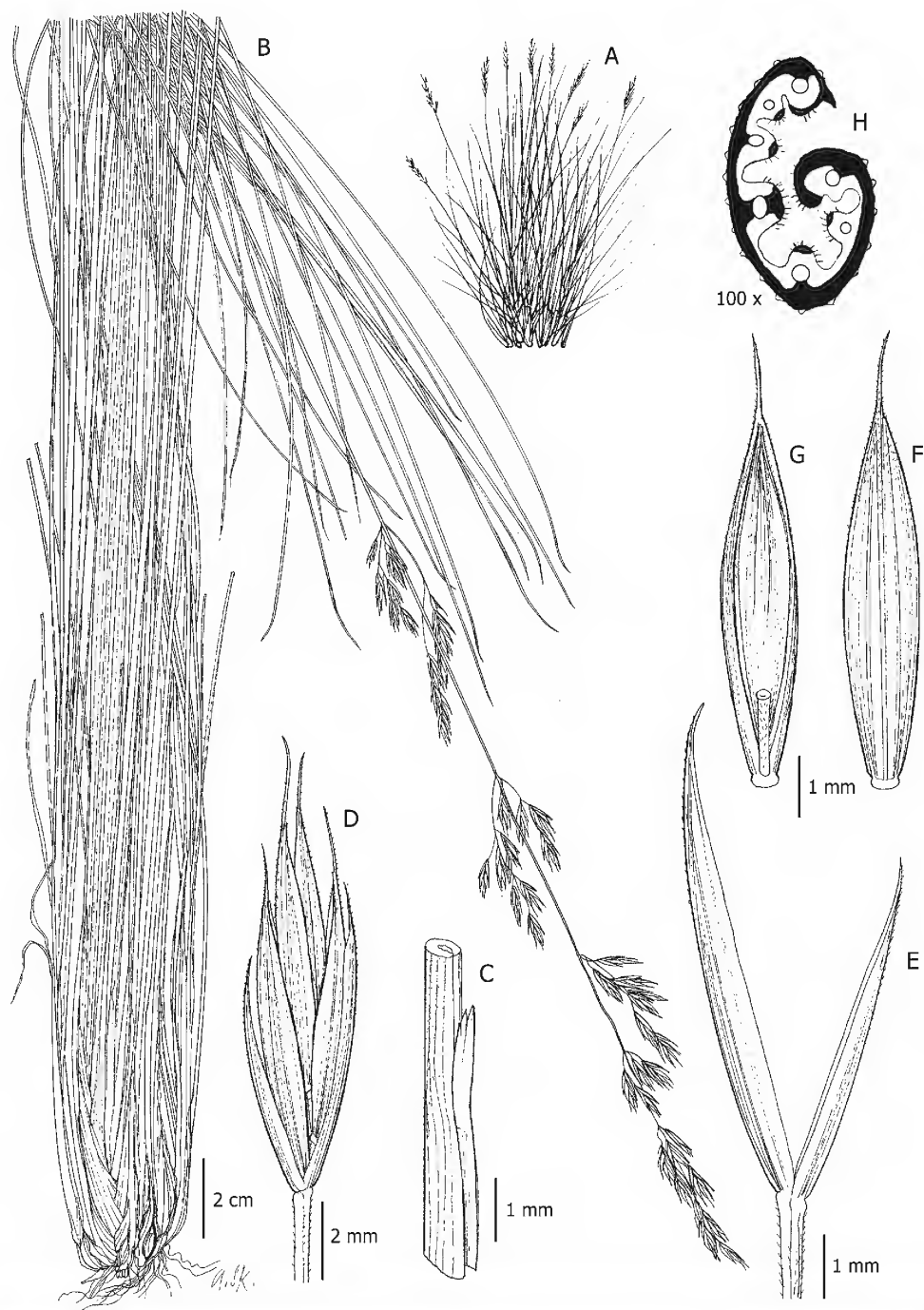


FIGURE 124. *Festuca tolucensis*. A. Stylized growth form. B. Habit. C. Ligule. D. Spikelet. E. Glumes. F. Lemma. G. Lemma with palea and rachilla. H. Leaf blade cross-section. Drawn by Anna Skoumalová for Smithsonian Institution, Department of Botany.

pino-encino [pine-oak forest], 2100 m, *R. Hernández* 8752 (CIIDIR, MEXU). **Mpio.?**: NW of Fraile, 29 Dec 1940, *L.R. Stanford, K. Retherford & R. Nortcraft* 405 (US).

### *Glyceria* R. Br.

**Plants** usually perennial, rarely annual; rhizomatous. **Culms** erect or decumbent, freely rooting at the lower nodes, not cormous based. **Sheaths** closed for at least  $\frac{3}{4}$  their length, often almost entirely closed; **ligules** scarious, erose to lacerate; **blades** flat or folded. **Inflorescences** terminal, usually panicles, sometimes racemes in depauperate specimens, branches appressed to divergent or reflexed. **Spikelets** cylindrical and terete or oval and laterally compressed, with 2–16 florets, terminal floret in each spikelet sterile, reduced; **disarticulation** above the glumes, below the florets. **Glumes** less than to equaling the adjacent lemmas,

1-veined, obtuse or acute, often erose; **lower glumes** 0.3–4.5 mm long; **upper glumes** 0.6–7 mm long; **calluses** glabrous; **lemmas** membranous to thinly coriaceous, rounded over the back, smooth or scabrous, glabrous or hairy, hairs to about 0.1 mm long, 5- to 11-veined, veins usually evident, often prominent and ridged, not or sparsely converging distally, apical margins hyaline, sometimes with a purplish band below the hyaline portion, apex acute to rounded or truncate, entire, erose, or irregularly lobed, unawned; **paleas** from shorter than to longer than the lemmas, keeled, keels sometimes winged; **lodicules** thick, sometimes connate, not winged; **anthers** (1)2–3; **ovaries** glabrous; **styles** 2-branched, branches divergent to recurved, plumose distally.  $x = 10$ .

*Glyceria* includes approximately 48 species, all of which grow in wet areas. All but five species are native to the Northern Hemisphere.

### KEY TO SPECIES OF *GLYCERIA*

1. Florets 6–12; lower glumes 1–2 mm long, upper glumes 2–2.5(3) mm long; lemma of inferior floret 3–4 mm long; panicle narrow ..... *G. borealis*
1. Florets 3–7; lower glumes 0.5–1 mm long, upper glumes 1–1.5 mm long, lemma of inferior floret 2–2.5 mm long; panicle ovoid, spreading ..... *G. striata*

170. *Glyceria borealis* (Nash) Batch., Proc. Manchester Inst. Arts Sci. 1: 74. 1900.

FIGURE 125

**Perennial.** **Culms** 60–100 cm tall, 1.5–5 mm thick, often decumbent and rooting at the lower nodes. **Sheaths** glabrous, keeled; **ligules** 4–12 mm long; **blades** 9–25 cm long, 2–7 mm wide, often floating, abaxial surfaces smooth, adaxial surfaces of the midcauline leaves densely papillose, glabrous. **Panicles** 18–40(50) cm long, 0.5–2(5) cm wide, arching, usually narrow, open at anthesis, bases often enclosed in the upper leaf sheath at maturity; **branches** 5–10(15) cm long, usually 1–3(5) per node, usually appressed to strongly ascending, occasionally spreading, longer branches with 3–6 spikelets; **pedicels** 1.2–5 mm long. **Spikelets** 9–22 mm long, 0.8–2.5 mm wide, cylindrical and terete, except at anthesis when slightly laterally compressed, rectangular in side view, with 8–12 florets; **glumes** elliptic, apex rounded to obtuse, sometimes erose; **lower glumes** 1.2–2.2 mm long; **upper glumes** 2–3.8 mm long, rounded; **rachilla internodes** 0.6–3.5 mm long; **lemmas** 2.7–5.4 mm long, veins raised, scaberulous or smooth, intercostal regions usually smooth, sometimes scaberulous, mid-vein terminating about (0.1)0.2 mm short of the apical margin, apex usually acute, sometimes obtuse, usually entire; **paleas** usually shorter than or equaling the lemmas, sometimes exceeding them by up to 0.5 mm long, keels narrowly winged, apex bifid, teeth to 0.2 mm long, parallel to weakly incurved; stamens 3, anthers 0.4–1.5 mm long. **Caryopsis** 1.2–2 mm long.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Glyceria borealis* is a widespread native species that grows in the North America

through the western mountains of the United States to Chihuahua, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Madera:** Lake near Chuichupa, 22 Aug 1937, *LeSueur* 0203 (US).

171. *Glyceria striata* (Lam.) Hitchc., Proc. Biol. Soc., Washington 41: 157. 1928.

FIGURE 126

**Perennial.** **Culms** 20–80 (100) cm tall, (1.5)2–3.5 mm thick, not or only slightly spongy, sometimes rooting at the lower nodes. **Sheaths** smooth to scaberulous, keeled, sometimes weakly so; **ligules** 1–4 mm long, usually rounded, sometimes acute to mucronate, erose-lacerate; **blades** 12–30 cm long, 2–6 mm wide, smooth or scaberulous. **Panicles** 6–25 cm long, 2.5–21 cm wide, pyramidal, open, nodding; **branches** 5–13 cm long, straight to lax, with 15–50 spikelets, these often confined to the distal  $\frac{2}{3}$ ; **pedicels** 0.5–7 mm long. **Spikelets** 1.8–4 mm long, 1.2–2.9 mm wide, laterally compressed, oval in side view, with 3–7 florets; **glumes** ovate, 1–1.5 times longer than wide, narrowing from midlength or above, veins terminating below the apical margins, apex often splitting with age; **lower glumes** 0.5–1.2 mm long, rounded to obtuse; **upper glumes** 0.6–1.2 mm long, acute or rounded; **rachilla internodes** 0.1–0.6 mm long; **lemmas** 1.2–2 mm long, ovate in dorsal view, veins raised, scaberulous over and between the veins, apex acute, prow-shaped; **paleas** slightly shorter than to equaling the lemma in length, 1.5–3 times wider than the glumes, keeled, keels not winged, tips pointing toward each other, apex narrowly notched between

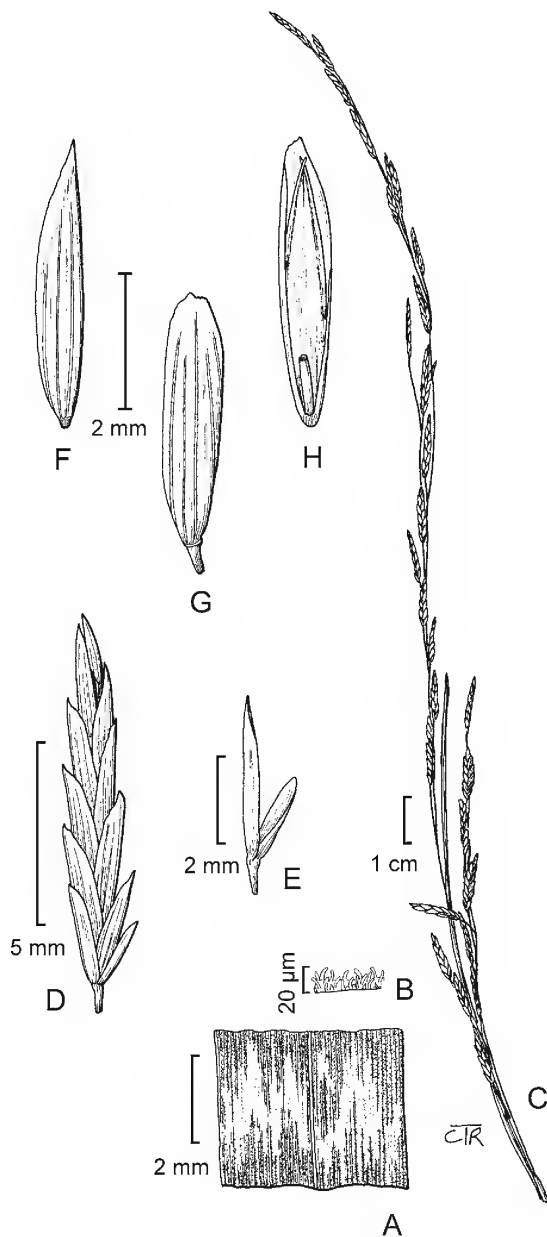


FIGURE 125. *Glyceria borealis*. A. Upper leaf surface. B. Papillose hairs, magnified. C. Inflorescence. D. Spikelet. E. Glumes. F. Floret, side view. G. Floret, dorsal view. H. Floret, ventral view showing palea and rachilla. Drawn by Cindy Roché; copyright Utah State University.

the keels; stamens 2, anthers (0.2)0.4–0.6 mm long, purple or yellow. Caryopsis 0.5–2 mm long.  $2n = 20$  (reports of 28 are questionable).

**DISTRIBUTION AND HABITAT.** *Glyceria striata* grows in bogs, along lakes and streams, and in other wet places. Its range extends from Canada and the United States to Mexico. There are two varieties; *Glyceria striata* var. *striata* is found in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. *Madera*: Sierra Madre near Col. Garcia, 6 Jul 1899, C.H.T. Townsend & C.M. Barber 112 (NMC, US).

### *Hackelochloa* Kuntze

Perennial; caespitose. Culms solid, very branched. Sheaths carinate; ligules a ciliate membrane; blades widely linear, flat. Inflorescence a solitary raceme, racemes terminal and axillary, exserted, aggregated into a spathate false panicle; rachis articulate, flattened, glabrous, spikelets in pairs, the 2 spikelets and the internodes of rachis falling as a unit. Spikelets dimorphic, unawned, sessile and pedicelate. Sessile spikelets globose, rigid, with 2 florets; callus truncate, with a short cylindrical projection; lower glumes very inflated, the superior portion rounded, blackish, 13- to 15-veined, the surface covered with squares sculpted in transverse rows or punctate on rows between the veins; upper glumes appressed to the internodes of rachis, oblong, 3-veined, obtuse, slightly carinate, chartaceous; inferior florets sterile; inferior lemma hyaline, inferior palea missing; superior florets bisexual, staminate, or sterile, superior lemma and palea hyaline, veinless, entire; stamens 3. Pedicelate spikelets herbaceous, sterile, rarely staminate; pedicel adnate to the rachis internodes; lower glumes ovate, acute, green, 7- to 9-veined, enclosing the margins of upper glumes by 2 borders; rudimentary florets missing or when present the inferior rudiment sterile, the superior floret staminate.

*Hackelochloa* includes two species from the tropics of Asia and a single species naturalized in Mexico (Clayton et al., 2006).

172. *Hackelochloa granularis*\* (L.) Kuntze, Revis. Gen. Pl. 2: 776. 189. *Cenchrus granularis* L., Mant. Pl. 2: 575. 1771. *Mnesithea granularis* (L.) de Koning & Sosef., Blumea 31(2): 295. 1986.

FIGURE 127

Perennial. Culms 10–120 cm tall. Sheaths inflated, hispid with tubercle-based hairs; ligules 0.8–1.5 mm long; blades 2–20 cm long, 4–15 mm wide, hispid with tubercle-based hairs. Racemes 7–15 mm long. Sessile spikelets 1–1.7 mm long; lower glumes 1.3–1.7 mm long, with the surface covered with squares sculpted in transverse rows; upper glumes 0.8–1 mm long; superior lemma and palea 0.8–1 mm long; anthers 0.2–0.4 mm long; pedicelate spikelets 1–1.9 mm long; anthers 0.3–0.5 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Hackelochloa granularis* occurs in grasslands, thorn scrub, and tropical forests at

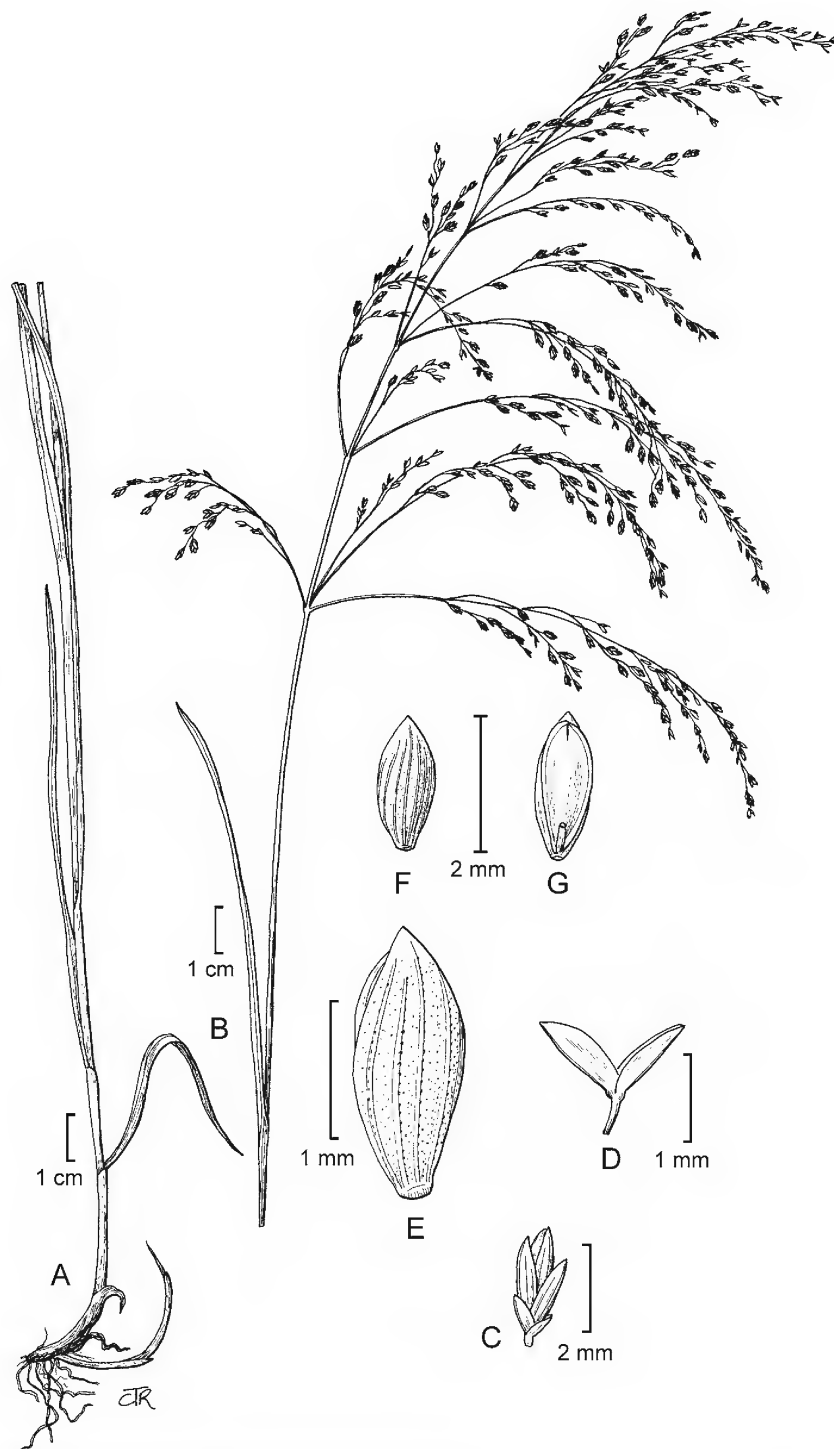
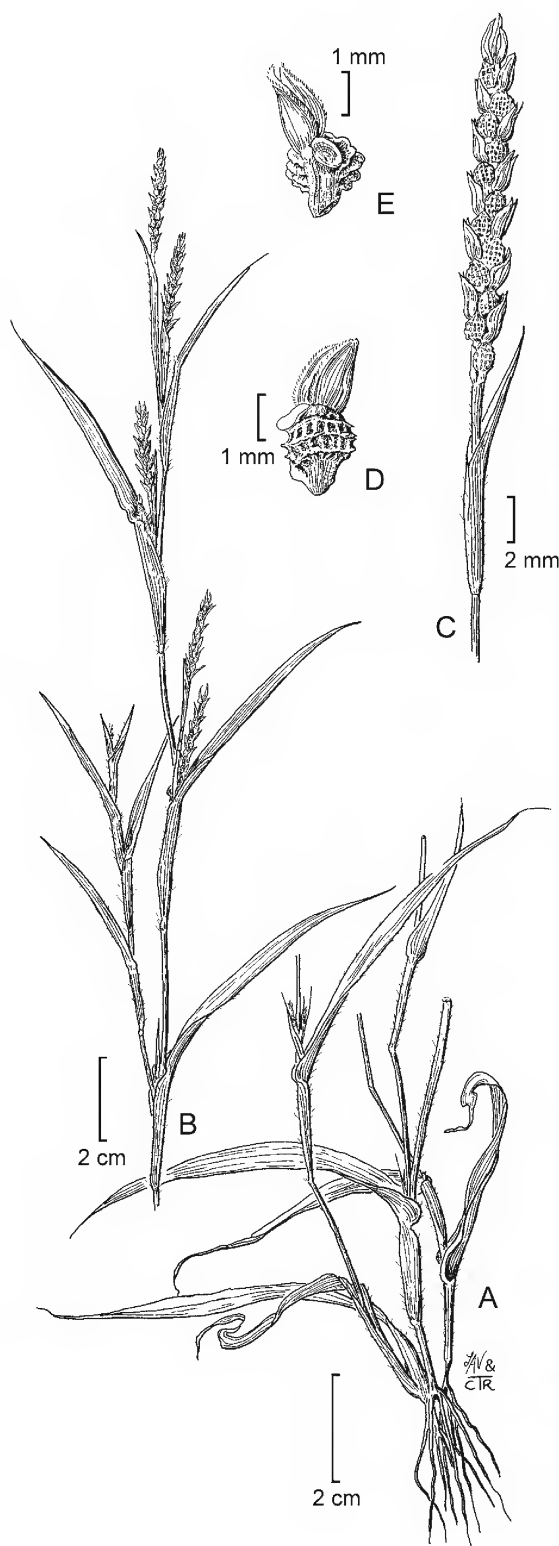


FIGURE 126. *Glyceria striata*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Glumes. E. Floret. F. Floret, dorsal view. G. Floret, ventral view. Drawn by Cindy Roché; copyright Utah State University.





1,100–1,980 m. It is native to the Eastern Hemisphere, introduced in the Americas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Near hwy, 20 km N of Chihuahua City, 9 Oct 1941, *R. Stewart & I.M. Johnson* 2128 (US); N Chihuahua, 18 Sep 1886, *C.G. Pringle* 1057 (US). **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20021, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Cuahtemoc:** 11 mi E of Cuahtemoc, 14 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3465 (US). **Guachochi:** 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, *P.M. Peterson, Annable & Y. Herrera* 8022 (US). **Ocampo:** Cascada Basaseachic, on N side of barranca, 12 Sep 1987, 1800 m, *J.T. Columbus, R.S. Spellenberg & D. Jewell* 1783 (NMC); Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 18 km from the Cahuisori–Ocampo road on the road to Candamena, 7.5 km below Cruz, 24 Sep 1994, 1260 m, *Spellenberg, Corral & Estrada* 12187-B (NMC).

### *Hesperostipa* (M. K. Elias) Barkworth

Perennial; caespitose, not rhizomatous. Culms erect, not branching at the upper nodes; prophylls shorter than the sheaths. Leaves not overwintering, not basally concentrated; cleistogenes not developed; sheaths smooth, auricles absent; ligules membranous, frequently ciliate; blades usually tightly involute, adaxial surfaces conspicuously ridged, apex narrowly acute, not sharp. Inflorescences terminal panicles, contracted or open. Spikelets with 1 floret; rachillas not prolonged beyond the base of the floret, disarticulation above the glumes and beneath the floret. Glumes tapering from near the base to a hairlike tip; florets narrowly cylindrical; calluses 2–6 mm long, sharp, densely strigose distally; lemmas indurate, smooth, margins flat, slightly overlapping at maturity, the upper portion fused into a papillose, ciliate crown, awned, lemma–awn junction distinct, awns persistent, twice-geniculate, often weakly so, lower segments twisted and scabrous to pilose, terminal segment not twisted, usually scaberrulous or pilose; paleas equal to the lemmas, flat, pubescent, coriaceous, 2-veined, veins terminating at the apex, apex indurate, prow-tipped; anthers 3. Caryopsis fusiform, not ribbed.  $\times = 11$ .

*Hesperostipa* is a North American endemic genus that resembles the Eurasian *Stipa sensu stricto* (s.s.) in overall morphology but is probably more closely related to the primarily South American genera *Piptochaetium*, *Anatherostipa* (Hack.

**FIGURE 127.** *Hackelochloa granularis*. A. Habit. B. Culm and Inflorescence. C. Inflorescence. D. Spikelet pair. E. Spikelet pair, rotated 180°. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

ex Kuntze) Peñail., *Aciachne* Benth., and *Lorenzochloa* Reeder & C. Reeder (Romaschenko et al., 2012). *Hesperostipa* differs from *Stipa* s.s. in having indurate palea apex and an unordered saw-like lemma epidermal pattern (Romaschenko et al., 2012).

173. *Hesperostipa neomexicana* (Thurb.) Barkworth, *Phytologia* 74(1): 16. 1993. *Stipa pennata* var. *neomexicana* Thurb., *Man. Bot. Rocky Mt.* 408. 1885. *Stipa neomexicana* (Thurb.) Barkworth, *Phytologia* 74(1): 16. 1993.

FIGURE 128

Culms 40–100 cm tall; lower nodes glabrous. Lower sheaths glabrous or puberulent, not ciliate; ligules of lower leaves 0.5–1 mm long, thickly membranous, rounded; ligules of upper leaves to 3 mm long, scarious, acute; blades 0.5–1 mm wide. Panicles 10–30 cm long; glumes 30–60 mm long, subequal; florets 15–18 mm long; calluses 4–5 mm long; lemmas evenly pubescent, hairs shorter than 1 mm long; awns 12–22 cm long, first 2 segments hairy, hairs mostly 0.2–1 mm long, terminal segment flexible, pilose, the hairs 1–3 mm long.  $2n = 44$ .

**DISTRIBUTION AND HABITAT.** *Hesperostipa neomexicana* grows in grassland, oak, and pinyon pine associations, usually in well-drained, rocky areas in the southwestern United States and adjacent Mexico; at 800 to 2,400 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: Sierra San Martin de Borracho, Rancho Carrizozo on the north side, 15 Jun 1973, Izotal on midslopes, chaparral on top, 1500–2195 m, M.C. Johnston & F. Chiang 11341 (MEXU).

### *Heteropogon Pers.*

Annual or perennial; caespitose. Culms simple or branched. Leaves sometimes aromatic and smelling of lemon oil or citronella; sheaths keeled, sometimes with a row of glandular depressions on the keel; ligules membranous, glabrous or ciliate. Inflorescences terminal and axillary; peduncles usually with 1 rame, sometimes with several in a digitate cluster; rames with 3–10 homogamous, unawned, sessile-pedicellate spikelet pairs on the lower  $\frac{1}{4}$ – $\frac{2}{3}$  and heterogamous, awned, sessile-pedicellate spikelet pairs distally, axes slender, without a translucent median groove; disarticulation in the rames, beneath the sessile spikelets of the heterogamous spikelet pairs, sometimes also below their pedicellate spikelets. Homogamous spikelet units sterile or staminate; calluses poorly developed; glumes membranous, many-veined, keels winged above. Heterogamous spikelet units: sessile spikelets bisexual, terete;

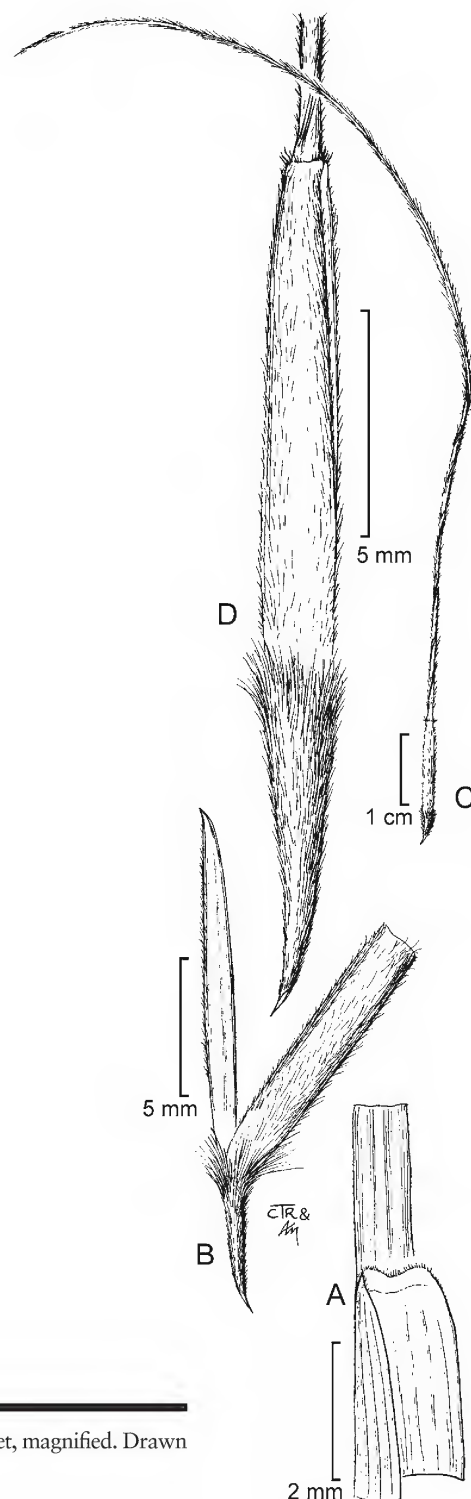


FIGURE 128. *Hesperostipa neomexicana*. A. Ligule. B. Glumes. C. Floret. D. Floret, magnified. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

calluses sharp, antrorsely strigose, hairs golden brown; glumes coriaceous, pubescent, concealing the florets; lower glumes enclosing the upper glumes, obscurely 5- to 9-veined; upper glumes sulcate, 3-veined; lower florets sterile, reduced to a hyaline lemma; upper florets bisexual, lemmas with conspicuous, geniculate awns; awns with hairs. Caryopsis lanceolate, sulcate on 1 side. Pedicels short, free of the rame axes, not grooved; pedicellate spikelets sterile or

staminate, larger than the sessile spikelets; calluses long, glabrous, functioning as pedicels; glumes membranous, many-veined, keels winged above.  $x = 10, 11$ .

*Heteropogon* is a pantropical genus of five species (Clayton et al., 2006). Probably both species that occur in the Western Hemisphere and here in Chihuahua are introduced (Barkworth, 2003a).

#### KEY TO SPECIES OF *HETEROPOGON*

1. Sessile and pedicellate spikelets 8–10 mm long, with stiff pubescence; glumes of the pedicellate spikelets lacking a row of glandular pits along the midvein; perennial . . . . . *H. contortus*
1. Sessile and pedicellate spikelets 15–20 mm long, glabrous; glumes of the pedicellate spikelets with a row of glandular pits along the midvein; annual . . . . . *H. melanocarpus*

174. *Heteropogon contortus*\* (L.) P. Beauv. ex Roem. & Schult., Syst. Veg. 2: 836. 1817. *Andropogon contortus* L., Sp. Pl. 2: 1045. 1753.

FIGURE 129

Perennial. Culms 20–150 cm tall, erect. Sheaths smooth, reddish; ligules 0.5–0.8 mm long, cilia 0.2–0.5 mm long; blades 10–15 cm long, 2–7 mm wide, flat or folded, glabrous or pubescent. Rames 3–7 cm long, secund, with 12–22 sessile-pedicellate spikelet pairs, brown to reddish-brown. Homogamous spikelets 6–10 mm long. Heterogamous spikelets: sessile spikelets 5–10 mm long, brown, awned; calluses 1.8–2 mm long, strigose; awns 6–10 cm long; pedicellate spikelets 6–10 mm long, unawned; glumes ovate-lanceolate, glabrous or with papillose-based hairs distally, without glandular pits, greenish to purplish-brown, becoming stramineous when dry.  $2n = 40, 50, 60$ .

**DISTRIBUTION AND HABITAT.** *Heteropogon contortus* grows on rocky hills and canyons in the southern United States, occupying a variety of different habitats, including disturbed sites. It is found in tropical and subtropical areas throughout the world.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** 13.3 (rd) mi NE of Aldama along Chihuahua Hwy 16, 14 Sep 1972, 1400 m, *J. Henrickson* 7532 (NMC). **Balleza:** 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 1990 m, *P.M. Peterson, Annable & Valdés-Reyna* 10743 (CIIDIR). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 115B (US); 14.5 km N of Batopilas on road to La Bufa, 12 Sep 1989, 850 m, *P.M. Peterson, Annable & Y. Herrera* 8063 (ENCB, US). **Buenaventura:** 10 km al sur [S] de San Buenaventura, 23 Oct 73, Matorral [scrub], 1400 m, *Valdés-Reyna* VR-734 (RELC). **Chihuahua:** Chihuahua, 14 Oct 1910, *Hitchcock* 7800 (US); Guazaremos, Río Mayo, 28 Sep 1936, *Gentry* 2890 (US). near Chihuahua, 6 Sep 1885, *C.G. Pringle* 480 (US); Rancho Experimental La Campana, 16 Oct 1980, pastizal [pastureland], 1500 m, *A. Melgoza* 634 (CIIDIR); Cerro Grande, 4 km al SO [SW] de Cd. Chihuahua, 11 Aug 1996, 1650 m, *E. Estrada & C. Yen* 4956 (NMC); 87 km N Chihuahua, 1 km S Arco Iris on Hwy 45, 5 Oct 1986, 1500 m,

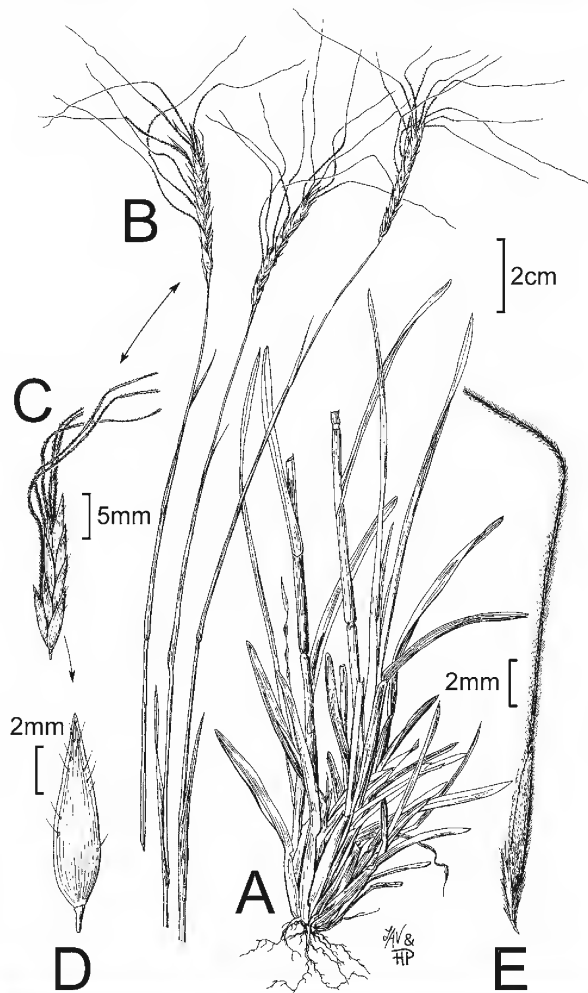


FIGURE 129. *Heteropogon contortus*. A. Habit. B. Culms with Inflorescences. C. Inflorescence. D. Lower glume of the pedicellate spikelet. E. Sessile spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

*Spellenberg, Soreng & R. Corral* 8905 (NMC); La Campana, Potrero La Sierra, 3 km Pte. carr. [hwy] Panamericana, 7 Sep 73, pastizal con encino, 1600 m, *Valdés-Reyna* VR-133 (RELC). **Guachochi:** W of Munérachi, 7 Sep 2003, bosque tropical, 1200 m, *P.M. Peterson & P. Catalán* 17716 (US). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 27 Aug 1939, 1460 m, *L. H. Harvey* 1618 (US). **Jiménez** 10 km SW of Cd. Jiménez, 30 Jul 1939, *L. H. Harvey* 1340 (US). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino, 1200 m, *O. Bravo* 1924 (CIIDIR); Paraje Agua Caliente, predio particular [private property] El Chorrillo, 17 Oct 1990, bosque de encino, 1500 m, *A. Benítez* 2009 (CIIDIR). **Manuel Benavides:** km 1773 carr. a Cd. Juárez, 15 Sep 55, *Hern.-Xol & V. Mathus* N-1806 (US); entre [between] Manuel Benavides & Pocitos, 2 Aug 76, pastizal, 1342 m, *S. González & J.M. Peña* 453 (RELC). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, *P.M. Peterson & Annable* 5980 (ENCB, US); *P.M. Peterson & R.M. King* 8260 (US). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P.M. Peterson & Annable* 5766 (US).

**175. *Heteropogon melanocarpus*\*** (Elliott) Benth., J. Linn. Soc., Bot. 19(115–116): 71. 1881. *Andropogon melanocarpus* Elliott, Sketch Bot. S. Carolina 1: 146. 1816.

Annual. Culms 50–200 tall, often with prop roots, freely branching above the base. Sheaths glabrous, with a row of glandular depressions along the keel; ligules 2–4 mm long, erose to lacerate, glabrous; blades 30–50 cm long, 3–12 mm wide, usually folded, abaxial surfaces with dark glandular depressions along the keel, adaxial surfaces with scattered papillose-based hairs near the base, scabrous elsewhere. Rames 2.5–6.5 cm long. Homogamous spikelets 10–14 mm long, green; lower glumes glabrous, unawned. Heterogamous spikelets: sessile spikelets 8–11.5 mm long, dark brown, awned; calluses about 3 mm long, the awns 10–15 cm long; pedicellate spikelets 16–21 mm long, unawned; lower glumes scabrous or sparsely ciliate distally, midveins glandular, pitted.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Heteropogon melanocarpus* is found in tropical regions throughout the world.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Puente Río Batopilas hacia [toward] la Hierbabuena, 24 Mar 2003, 1942 m, *Tenorio, R. Alvarado & M. Hilerio* 22848 (US). **Chihuahua:** Mapula Mts., Oct 1886, *C.G. Pringle* 8201 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 3.8 km NE of La Bufa and 9.6 km S of Kirare, 1240 m, *P.M. Peterson, Annable & Valdés-Reyna* 10835 (US).

### *Hilaria* Kunth

Perennial or annual; tufted or caespitose, sometimes stoloniferous, perennial species sometimes rhizomatous. Culms erect or decumbent; nodes usually villous or pilose, particularly the upper nodes. Sheaths open, glabrous or pilose, lower sheaths often glabrous basally and pilose distally, margins sometimes villous or pilose, upper sheaths often glabrous even if the lower sheaths are pilose; ligules membranous, lacerate or ciliate. Inflorescences terminal, spikelet-like panicles of reduced, disarticulating branches, exceeding the upper leaves; branches with 3 spikelets, appressed to the rachises, bases straight, seated in a ciliate, cup-like structure, sometimes with a callus, calluses pilose, axes not extending past the distal florets; disarticulation at the base of the branches, leaving the zigzag rachises. Lateral spikelets of each branch shortly pedicellate, with 1–4(5) sterile or staminate florets; glumes almost as long as the florets, deeply cleft into 2 or more lobes, with 1 or more dorsal awns; lemmas membranous, hyaline. Central spikelets sessile, with 1 pistillate or bisexual floret; glumes shorter than the florets, rigid, indurate and fused basally, apex with 2 or more lobes; lemmas membranous, awned or unawned.  $x = 9$ .

*Hilaria* is a genus of 10 species that ranges from the southwestern United States to northern Guatemala. Based on molecular DNA studies, *Hilaria* can be divided into two subgenera, *H. subg. Pleuraphis* (Torr.) Columbus, which includes *H. mutica* and *H. rigida*, and *H. subg. Hilaria*, which includes *H. belangeri*, *H. cenchroides*, and *H. ciliata* (Peterson et al., 2016).

### KEY TO SPECIES OF *HILARIA*

1. Glumes hyaline and fimbriate at the apex; plants forming colonies from the growing rhizomes, the rhizomes indurate and scaly.
  2. Culms tomentose pubescent . . . . . *H. rigida*
  2. Culms glabrous . . . . . *H. mutica*
1. Glumes firm, not fimbriate at the apex; plants forming simple mats united by slender stolons, arched, not rhizomatous.
  3. Glumes of lateral spikelets as long as the lemmas; glomerules 6–8 mm long . . . . . *H. wallenii*
  3. Glumes of lateral spikelets much shorter than lemmas; glomerules 3.5–6.5 mm long.
    4. Spikelets whitish or pallid, occasionally pinkish or purple; lateral spikelets 5–6 mm long, central spikelets (3.5)4–5 mm; glumes with black glands lacking or not abundant . . . . . *H. belangeri*
    4. Spikelets generally gray or black; lateral spikelets 4.5–5.6 mm long, central spikelets 5–6 mm long; glumes with numerous and conspicuous black glands.
      5. Glume awns of the central spikelet about 1 mm long, with short cilia; ligules 2–2.5 mm long . . . . . *H. ciliata*
      5. Glume awns of the central spikelet about 3 mm long, scabrous; ligules 1.5–2 mm long . . . . . *H. cenchroides*

176. *Hilaria belangeri* (Steud.) Nash, N. Amer. Fl. 17(2): 135. 1912.

Perennial; caespitose, usually stoloniferous. Culms 5–35 cm tall, erect; nodes villous. Sheaths striate, glabrous; ligules 1–3 mm long, often lacerate; blades 3–15 cm long, 1–3.5 mm wide, adaxial surfaces sparsely pilose, hairs papillose-based, margins sparsely pilose basally, with similar hairs. Panicles 2–4 cm long; involucre 5–8 mm long. Lateral spikelets with 2(3) staminate florets, or 1 sterile floret; glumes unequal, thick, indurate, and conspicuously fused basally, thinner distally, asymmetrically lobed, scabrous, pale to purplish, bases sometimes spotted with a few dark glands, margins wide, hyaline, awns 1 or more, attached below midlength, equaling or exceeding the central spikelets, antrorsely scabrous; lower glumes wider, more deeply lobed, with longer awn(s) than the upper glumes; stamens 3, anthers 3–3.7 mm long. Central spikelets as long as or longer than the lateral spikelets, with 1 pistillate floret; glumes terminating in 1 or more antrorsely scabrous awns.  $2n = 36, 72, 74$ .

**DISTRIBUTION AND HABITAT.** *Hilaria belangeri* ranges from the United States to Mexico in Aguascalientes, Baja California, Baja California Sur, Chihuahua, Coahuila, Guanajuato, Guerrero, México, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla, Querétaro, Sonora, and Tamaulipas. It has two varieties, only the typical variety is found in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

177. *Hilaria cenchroides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 117, t. 37. 1815.

Perennial; caespitose, stoloniferous. Culms 5–60 cm long, erect, nodes bearded. Sheaths longer than adjacent culm internode, striately veined, outer margin hairy; ligules 1.5–2 mm long, an eciliate membrane, lacerate; blades 3–10 cm long, 2–4 mm wide, flat or involute, stiff, surface ribbed, rough on both sides, glabrous or pilose, margins scabrous. Panicles composed of racemes; racemes 0.4–0.8 cm long, borne along a central axis; closely spaced; in a multilateral false spike, cuneate, unilateral, axis 2–6 cm; deciduous from axis, spikelets 1 fertile and 2 sterile, sessile. Sterile spikelets 3–5 mm long, 2–4-flowered; lemmas as long as the bisexual spikelets, empty or male, oblong, asymmetrical, dorsally compressed, exserted from the glumes, apex mucicous; glumes 1.5–4 mm long, 5- to 11-veined, scabrous, united below, coriaceous, 2-lobed, truncate or obtuse, both glumes awned, the awn 1–2 mm long, lemmas 2–4, exserted from glumes. Bisexual spikelets 4–7.5 mm long, 1-flowered, oblong, laterally compressed, falling entire and with sterile spikelets; glumes 4–5 mm long, ovate, coriaceous, black, 1-keeled, 7-veined, scabrous, equal, connate along margins below, shorter and firmer than fertile lemmas, apex 2-lobed, truncate or obtuse, 1-awned, the awn about 3 mm long; lemmas 5–6 mm long, ovate, laterally compressed, cartilaginous, keeled, 3-veined, apex caudate; stamens 3, anthers 3–3.5 mm long.  $2n = 44$ .

#### DISTRIBUTION AND HABITAT.

*Hilaria cenchroides* is distributed in the grasslands of Mexico and Central America. This species grows on dry slopes, flats, and along gravelly drainages in desert scrub and pine-oak woodlands commonly associated with *Acacia*, *Quercus intricata* Trel., *Pinus cembroides*, *Rhus virens* Lindh. ex A. Gray, *Bouteloua dactyloides*, *Juniperus deppeana* Steud., *Baccharis*, *Opuntia*, *Stevia*, and *Viguiera*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

178. *Hilaria ciliata* (Scribn.) Nash, N. Amer. Fl. 17(2): 136. 1912.

Perennial; caespitose, stolons present. Culms 20–45 cm tall, tufted, erect, bearded below inferior nodes. Sheaths striate, mostly shorter than internodes, glabrous, the inferior sparsely papillose-pilose over the collar; ligules 2–2.5 mm long, eciliate membrane, sparsely pilose; blades 1.5–15(20) cm long, 3–5 mm wide, scabrous, sometimes with some papillose hairs on margins. Panicles composed of racemes, the racemes 3–5 cm long, in a multilateral false spike, cuneate, rachis pilose; glomerules or false involucre 3.5–5(5.8) mm long with 1 fertile spikelet and 2 sessile and sterile spikelets. Sterile spikelets 3–4 mm long, as long as bisexual spikelets, well-developed, male, oblong, asymmetrical, laterally compressed; glumes united below, coriaceous, 5-veined, scabrous, ciliolate on margins, mucicous; lemmas 3, exserted from glumes, apex mucicous. Bisexual spikelets 4–7.5 mm long, 1-flowered, oblong, laterally compressed, falling entire and with sterile florets; glumes shorter than the spikelet, asymmetrical, coriaceous, pallid, 1-keeled, scabrous, connate along the margins below, the margins ciliolate, apex 2-lobed, awned, the awn 1 mm long; lower glumes 1.2–2 mm long, 3-veined, awned; upper glumes 2.8–3.8 mm long, 5-veined; fertile lemma 3–4 mm long, ovate, laterally compressed, cartilaginous, keeled, 3-veined, apex caudate; stamens 3, anthers 3–3.5 mm long.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Hilaria ciliata* is a Mexican species cited from Baja California, Baja California Sur, Chihuahua, Colima, Guanajuato, Guerrero, Jalisco, Michoacán, Nayarit, Oaxaca, Querétaro, San Luis Potosí, Sonora, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

179. *Hilaria mutica* (Buckley) Benth., J. Linn. Soc., Bot. 19: 62. 1881. *Pleuraphis mutica* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 95. 1862.

FIGURE 130

Perennial; caespitose, rhizomatous. Culms 30–60 cm tall, erect, geniculate at the middle nodes; nodes glabrous or pubescent, hairs to 0.3 mm. Sheaths glabrous or sparsely pilose on the margins; ligules 0.5–2 mm long, lacerate; blades 2–15 cm



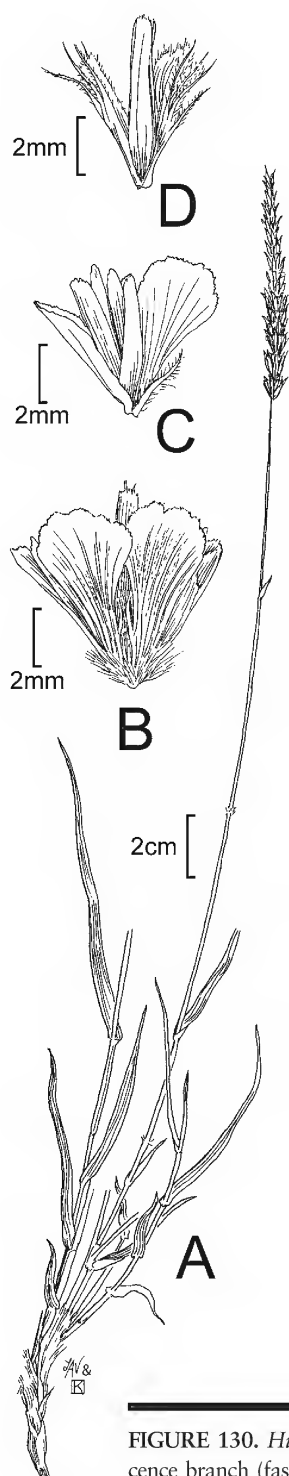


FIGURE 130. *Hilaria mutica*. A. Habit. B. Inflorescence branch (fascicle of spikelets). C. Lateral spikelets. D. Central spikelet. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

long, 2–4 mm wide, mostly scabrous on both surfaces, with papillose-based hairs behind the ligules. Panicles 4–8 cm long; involucre 5–8 mm long. Lateral spikelets with 1 or 2(4) staminate florets; glumes not conspicuously fused basally, thin, hyaline, papery, flabellate, dorsally awned, awns not exceeding the apex, apical lobes rounded, ciliate to finely lacinate, veins not or sparsely excurrent; anthers 3, 2.5–3.5 mm long. Central spikelets with 1 bisexual floret; glumes with 1 or more divergent, dorsal awns, apical lobes, ciliate to finely lacinate, veins excurrent; lemmas exceeding the glumes, bilobed, mucronate.  $2n = 36, 54$ .

**DISTRIBUTION AND HABITAT.** *Hilaria mutica* grows in alkaline flats, level upland areas, and desert valleys subject to occasional flooding but lacking permanent streams. Its range extends from southwestern United States to northern Mexico in Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo León, Sonora, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Rancho El torreño # 3, 25 Sep 1982, matorral inerme parvifolio [unarmed small-leaved scrub], 1150 m, G. Melgosa 36 (CIIDIR). **Camargo:** Rancho San Francisco, 21 Sep 76, matorral, 1300 m, S. González 479 (RELC); 1 mi S of Camargo, 6 Sep 1967, Reeder & C. Reeder 4868 (ARIZ, US); 21 mi N of Camargo, 5 Sep 1967, Reeder & C. Reeder 4863 (ARIZ, US); 3 mi N of Cd. Camargo on Hwy 45, 18 Aug 1959, D. Marsh 1904 (US); Preson Ortega, 31 mi NE of Camargo, 25 Sep 1938, E. Shreve 8895 (US). **Chihuahua:** near Chihuahua, 2 Sep 1885, C.G. Pringle 485 (US); S of Chihuahua, 1 Aug 1936, LeSueur 0132 (US); 13 mi SE of Cd. Chihuahua, 5 Sep 1967, 1478 m, Reeder & C. Reeder 4862 (ARIZ, US); 80 km de Chihuahua hacia Cd. Juárez, 11 oct 1980, pastizal amacollado [grass pasture], 1550 m, Valdés-Reyna s.n. (CIIDIR); 7 km Ote. [W] del Rancho el 45, 26 Sep 73, 1480 m, Valdés-Reyna VR-364 (RELC); km 54 carr. [hwy] Panamericana Chihuahua–Cd. Juárez, 14 Oct 74, matorral, 1500 m, Valdés-Reyna VR-637 (RELC). **Cuauhtémoc:** 23 mi NW of Zavalza, 3 Oct 1966, 4800 ft, Reeder & C. Reeder 4578 (ARIZ). **Delicias:** 7 mi S of Delicias along Hwy 45, 24 Sep 1972, J. Henrickson 7991 (NMC). **General Trías:** km 40 carr. Chihuahua–Cuauhtémoc, 12 Aug 76, lomeríos [lorries], 1693 m, S. González & J.M. Peña 540 (RELC). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 29 Aug 1939, 1460 m, L. H. Harvey 1534 (US). **Jiménez:** 5 mi E of Carrillo, C.H. Muller 3321 (US); 11 mi N of Jiménez, 3 Sep 1967, Reeder & C. Reeder 4870 (ARIZ, US); 14 mi SE of Jiménez, 3 Sep 1967, Reeder & C. Reeder 4839 (ARIZ, US); Sta. Eulalia plains, 2 Sep 1885, E. Wilkinson 557 (US); 33 mi SE of Jiménez, 27 Sep 1963, Reeder & C. Reeder 3843 (ARIZ, US); 10 km E of Jimenez, 31 Jul 1939, L. H. Harvey 1348 (US); Reserva de la Biosfera de Mapimí, Rancho La Soledad, 6 Jul 1997, vegetación secundaria [secondary vegetation], 1113 m, A. García 2645 (CIIDIR); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, D. Ramírez & M.L. Juárez 3378 (CIIDIR); 50 km al S de Jiménez, 15 Aug 2010,

1442 m, *D. Ramírez & M.L. Juárez* 3415 (CIIDIR). **Meoqui:** Meoqui, 24 Jun 1935, *LeSueur Mex 040* (US). **Saucillo:** 19 mi NW of Naica, Dto. de Saucillo, 30 Jul 1937, *F. Shreve* 8080 (US).

180. *Hilaria rigida* (Thurb.) Benth. ex Scribn., Bull. Torrey Bot. Club 9(3): 33. 1882. *Pleuraphis rigida* Thurb., Bot. California 2: 293–294. 1880.

FIGURE 131

Perennial; with hard rhizomatous base. Culms 1.5–2.5 m tall, in large groups, rigid, branched, tomentose pubescent. Sheaths overlapping, scabrous; ligule 1 mm long, a row of fine hairs; blades 2–5 cm long, 2–4 mm wide, slightly involute, scabrous. Panicles 3–9 cm long, involucre 6–12 mm long, densely barbed on the base; lateral spikelets staminate with 2–4 florets, superior floret sterile; glumes thin, fimbriate, hyaline, 7-veined, almost always 2- to 4-lobed on the apex, apex wide, 1–3 veins that terminate in slender awns, or the veins are inconspicuous and sparsely excurrent (variable in the same inflorescence). Central spikelets bisexual, 1-flowered, equal or longer than the lateral spikelets; glumes narrow, fimbriate, hyaline with several awns and 2 or more lobes deeply notched; lemma frequently longer than the glumes, slender, ciliate, 2- to 4-lobed, the midvein excurrent into a short awn.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Hilaria rigida* grows in pine forests; it ranges from the United States to Mexico in Baja California, Chihuahua, Oaxaca, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes:** Col. Díaz, 30 Mar 1894, *E.A. Mearns* 2848/406 (US).

181. *Hilaria swallenii* Cory, Wrightia 1: 215. 1948.

Perennial; stoloniferous. Culms 10–35 cm long, erect; nodes villous. Sheaths slightly scabrous; ligules 2–2.2 mm long; blades to 8 cm long, 1–2 mm wide, mostly basal, both surfaces scabrous, sometimes also sparsely pilose. Panicles 1–4 cm long, with 2–8 involucre; involucre 6.5–8 mm long. Lateral spikelets 2-flowered, lowest florets usually sterile, distal florets staminate; glumes unequal, thick, indurate, and conspicuously fused basally, mostly gray to dark brown, evenly and sparsely to densely spotted with dark glands, awned from above midlength, margins hyaline; stamens 3, anthers 3–3.5 mm long. Central spikelets with 1 pistillate floret; lemmas elliptic basally, narrower and parallel-sided distally.  $2n = 54, 72$ .

**DISTRIBUTION AND HABITAT.** *Hilaria swallenii* grows on dry plains and rocky mesas in New Mexico, Texas, and northern Mexico in Chihuahua, Coahuila, Durango, Nuevo León, San Luis Potosí, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocono:** Sánchez, 12 Oct 1910, *Hitchcock* 7694 (US). **Chihuahua:** near Chihuahua, 23 Aug 1885, *C.G. Pringle* 493 (US); La Campana, Potrero del Plan, 3 km Ote. [W] carr. [hwy] Panamericana,

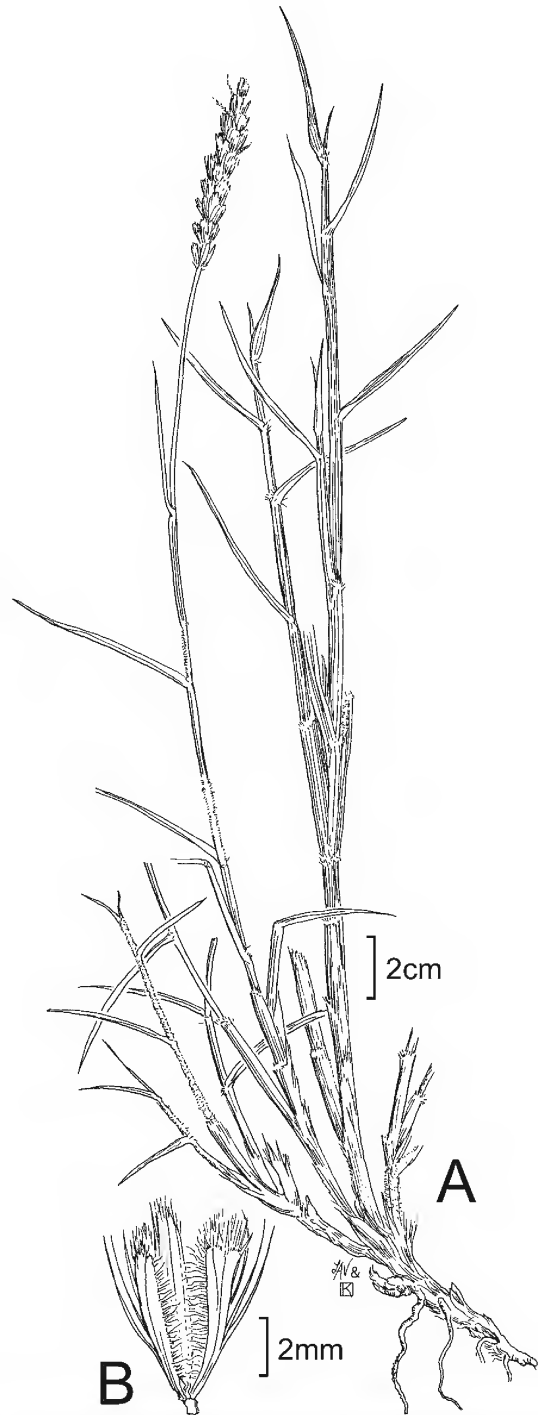


FIGURE 131. *Hilaria rigida*. A. Habit. B. Inflorescence branch (fascicle of spikelets). Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

13 Sep 73, pastizal [pastureland], 1500 m, *Valdés-Reyna* VR-236 (RELC); 4 km al Ote. carr. Panamericana, 1 Sep 74, pastizal, 1500 m, *Valdés-Reyna* VR-604 (RELC).

### *Holcus* L.

Plants usually perennial, rarely annual; caespitose or rhizomatous, rarely both caespitose and rhizomatous. Culms glabrous or pubescent; nodes glabrous or retrorsely pubescent. Sheaths open; auricles absent; ligules membranous, entire or erose-ciliate, glabrous or puberulent; blades flat, pubescent. Inflorescences terminal panicles, contracted to open. Spikelets laterally compressed, with 2(3) florets, lower florets bisexual, upper floret(s) staminate or sterile; rachillas curved below the lowest florets, sometimes prolonged beyond the uppermost florets; disarticulation below the glumes. Glumes equaling to exceeding the florets, strongly keeled; lower glumes 1-veined; upper glumes 3-veined; calluses glabrous or pubescent; lemmas firm, shining, glabrous or pubescent, obscurely 3- to 5-veined, often bidentate; lower lemmas unawned; upper lemmas awned from below the apex, awns hooked or geniculate; paleas thin, subequal to the lemmas; lodicules 2, glabrous, toothed or not toothed; anthers 3; ovaries glabrous. Caryopsis glabrous.  $\times = 4, 7$ .

*Holcus*, a genus of eight species, is native to Europe, North Africa, and the Middle East.

182. *Holcus lanatus*\* L., Sp. Pl. 2: 1048. 1753.

FIGURE 132

Perennial; caespitose, not rhizomatous. Culms 20–100 cm tall, erect, sometimes decumbent, lower internodes densely pilose, with hairs to 1 mm long, uppermost internode often glabrous. Sheaths densely pubescent; ligules 1–4 mm long, truncate, erose-ciliate; blades 2–20 cm long, (3)5–10 mm wide, densely soft-pubescent. Panicles 3–15(20) cm long, 1–8 cm wide; branches hirsute; pedicels 0.2–1.6(4) mm long, pilose, hairs to 0.3 mm. Spikelets 3–6 mm; rachillas 0.4–0.5 mm long, glabrous; glumes exceeding and enclosing the florets, membranous, ciliate on the keels and veins, usually scabrous, puberulent, or villous between the veins, especially toward the apex, whitish-green, often purple over the veins and toward the apex; lower glumes lanceolate, narrow, acute; upper glumes ovate, wider and longer than the lower glumes, midveins often prolonged as an awn to 1.5 mm long, apex obtuse, somewhat bifid; calluses sparsely hirsute; lemmas 1.7–2.5 mm long, acute, erose-ciliate; upper lemmas shallowly bifid, awns 1–2 mm long, often



FIGURE 132. *Holcus lanatus*. A. Habit. B. Ligule. C. Glumes. D. Florets. E. Caryopsis. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

purple-tipped, slightly twisted and strongly hooked at maturity; anthers (1.2)2–2.5 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Holcus lanatus* grows in disturbed sites, moist waste places, lawns, and pastures in a wide range of edaphic conditions; 0–2,300 m. A native of Europe, *Holcus lanatus* was widely distributed in North America by 1800.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

### *Hopia* Zuloaga & Morrone

Perennial; short rhizomatous and long stoloniferous. Culms not cormous at the base, not branched above the base; nodes swollen, villous, particularly on the stolons. Ligules membranous, papery; blades linear-lanceolate, cross sections with Kranz anatomy with a single mestome sheath surrounding the vascular bundles and in contact with the metaxylem vessels. Panicles contracted; branches spikelike, appressed, 1-sided, spikelets borne in pairs. Spikelets ellipsoid to obovoid. Lower glumes  $\frac{3}{4}$ – $\frac{4}{5}$  as long as the spikelets, 5- to 7-veined; upper glumes subequal to the lower lemmas, 7- to 11-veined, blunt; lower florets staminate; lower paleas well-developed; upper florets obovoid, indurate, smooth, with microhairs and simple papillae near the base and tip.  $x = 10$ .

*Hopia* is a unispecific genus that extends from the southwestern United States into northern Mexico.

183. *Hopia obtusa* (Kunth) Zuloaga & Morrone, Taxon 56: 151. 2007. *Panicum obtusum* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 98–99. 1815.

FIGURE 133

Perennial; usually from long slender stolons or shallow rhizomes with swollen, villous nodes. Culms 20–80 cm tall, often in small clumps, compressed, erect or decumbent, glaucous; lower nodes pubescent; upper nodes glabrous. Lower sheaths ascending, pubescent to pilose; upper sheaths glabrous; ligules 0.2–2 mm long, membranous, truncate, irregularly denticulate; blades 3–26 cm long, 2–7 mm wide, ascending, firm, glaucous, sparsely pilose near the base, often scabrous on the margins, involute toward the apex. Panicles 5–15 cm long, 0.8–1.5 cm wide; branches 2–6, spikelike, erect, puberulent, 3-angled; ultimate branchlets 1-sided; pedicels paired, congested, shorter pedicels 0.1–1 mm long, longer pedicels 1.5–2.5 mm long. Spikelets 2.8–4.4 mm long, ellipsoid, terete to slightly laterally compressed, glabrous, obtuse; lower glumes about  $\frac{3}{4}$  as long as the spikelets, 5- to 7-veined; upper glumes and lower lemmas equaling the spikelets, 5- to 9-veined; lower florets staminate; lower paleas 2.5–3.5 mm long; upper florets puberulent at the bases and apex.  $2n = 20, 36, 40$ .

**DISTRIBUTION AND HABITAT.** *Hopia obtusa* grows in seasonally wet sand or gravel, especially on stream banks, ditches, roadsides, wet pastures, and rangeland.

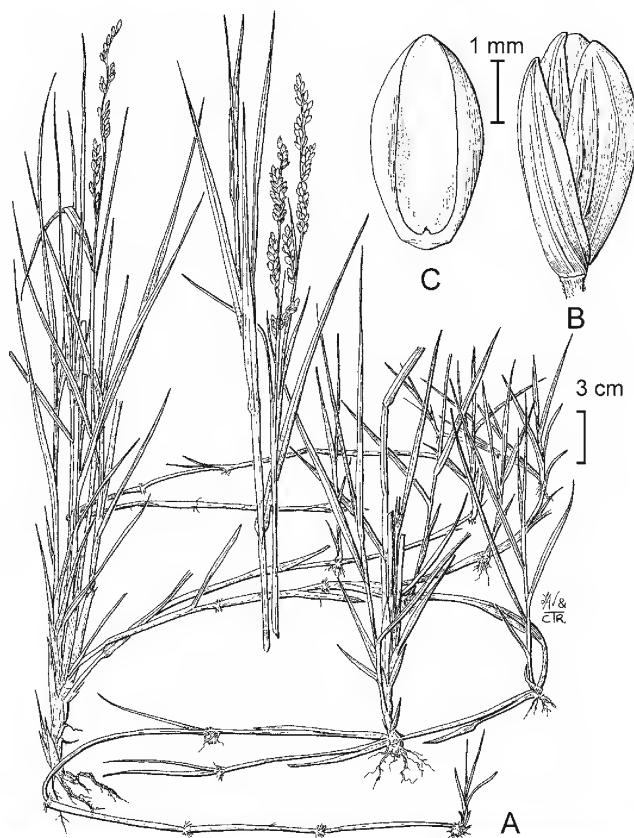


FIGURE 133. *Hopia obtusa*. A. Habit. B. Spikelet. C. Upper floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ascensión:** alrededores del cruce del río [around the river crossing] Casas Grandes con la carr. [hwy] Juárez–Ascensión, 11 Jun 2005, 1180 m, R. Corral, M. Vargas & H. Gutiérrez RCD 7154 (UACJ). **Casas Grandes:** El Alamito, Col. Cuauhtémoc, 12 Aug 1996, P. Olivas, R. Rivas, I. Enríquez & A. Márquez POS838 (UACJ). **Chihuahua:** S of Chihuahua, 1 Aug 1936, LeSueur 131 (US); near Chihuahua, 20 Sep 1885, C.G. Pringle 476 (US); 4 km al W de Sacramento, 10 Aug 1971, matorral [scrub] de Prosopis, 1550 m, F. Jiménez 84 (ENCB); La Campana, Potrero La Reserva, 14 km Ote. [W] carr. Panamericana, 26 Aug 1973, pastizal halófito [halophyte grassland], 1480 m, Valdés-Reyna VR-25 (RELC). Potrero El Plan, 4 km Ote. carr. Panamericana, 6 Sep 73, orilla de lotes de producción de semilla [edge of seed-production lots], 1500 m, Valdés-Reyna VR-93 (RELC). **Cuauhtémoc:** 21 km W of Cuauhtémoc, on Hwy 16, 23 Aug 1990, 2000 m, P.M. Peterson & Annable 9597 (US). **Cusihiuriáchi:** Río Papigochic, 40 km de Cuauhtémoc, carr. Cuauhtémoc–Ocampo,

8 Aug 1976, pastizal, 2100 m, *J.M. Peña JMP-88* (RELC). **Guadalupe:** NE Chihuahua, vicinity of Rancho El Pino, ca 10 km SE of Sierra Rica, 23 Sep 1942, *Stewart* 2398 (US). **Gran Morelos:** 10 mi W of General Trias off hwy 16, 19 Jul 1975, scrub junipers on rocky alluvium, 5850 ft, *Ellis, Dunn & Wallace* 937 (ENCB). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 27 Aug 1939, 1450 m, *L. H. Harvey* 1630 (ENCB, US). **Jiménez:** 5 mi N of Jiménez on Mex 45, 30 Aug 1971, 4400 ft, *L. H. Harvey* 8899 (ENCB); 10 km E of cd. Jiménez, 31 Jul 1939, 1340 m, *L. H. Harvey* 1349 (ENCB); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez & M.L. Juárez* 3380 (CIIDIR). **Riva Palacio:** 40 km W of Chihuahua, 20 Aug 1939, 1735 m, *L. H. Harvey* 1551 (US). **Temosachi:** About 2 mi of Natachic, 9 Jul 1950, on the flood plain of a small river, *Reeder, C. Reeder & Goodding* 1241 (ENCB).

### ***Hordeum* L.**

Plants summer or winter annuals or perennials; caespitose, sometimes short rhizomatous. Culms to 135(150) cm long, erect, geniculate, or decumbent; nodes glabrous or pubescent. Sheaths open, pubescent or glabrous; auricles present or absent; ligules

hyaline, truncate, erose; blades flat to more or less involute, more or less pubescent on both sides. Inflorescences usually spike-like racemes, sometimes spikes, all customarily called spikes, with 3 spikelets at each node, central spikelets usually sessile, sometimes pedicellate, pedicels to 2 mm long, lateral spikelets usually pedicellate, pedicels curved or straight, sometimes all 3 spikelets sessile in cultivated plants; disarticulation usually in the rachises, the spikelets falling in triplets, cultivated forms generally not disarticulating. Spikelets with 1 floret; glumes awn-like, usually exceeding the floret. Lateral spikelets usually sterile or staminate, often bisexual in cultivated forms; florets pedicellate, usually reduced; lemmas awned or unawned. Central spikelets bisexual; florets sessile; rachillas prolonged beyond the floret; lemmas ovate, glabrous to pubescent, 5-veined, usually awned, rarely unawned; paleas almost equal to the lemmas, narrowly ovate, keeled; lodicules 2, broadly lanceolate, margins ciliate; anthers 3, usually yellowish. Caryopsis usually tightly enclosed in the lemma and palea at maturity.  $2n = 14, 28, 42$ .

*Hordeum* is a genus of 43 species that grow in temperate and subtropical areas at elevations from 0 to 4,500 m. The genus is native to Eurasia, the Americas, and Africa and has been introduced to Austral Asia.

### KEY TO SPECIES OF *HORDEUM*

1. Auricles to 8 mm long, well-developed even on the upper leaves; lemmas of the lateral florets 6–15 mm long.
  2. Rachises disarticulating at maturity; glumes of the central spikelets ciliate; lemmas of the central florets to 2 mm wide, with awns 20–40 mm long; lateral spikelets staminate ..... *H. murinum*
  2. Rachises usually not disarticulating at maturity; glumes of the central spikelets pubescent; lemmas of the central florets at least 3 mm wide, unawned or with awns 30–180 mm long; usually 1 or both lateral spikelets at a node seed-forming ..... *H. vulgare*
1. Auricles usually absent or to 0.3 mm long; lemmas of the lateral florets 1.7–8.5 mm long.
  3. Lemmas of the lateral spikelets 7–11 mm long, with awns 3–8 mm long ..... *H. murinum*
  3. Lemmas of the lateral spikelets 2.5–5.7 mm long, with awns up to 1.8 mm long ..... *H. pusillum*

184. *Hordeum murinum*\* L., Sp. Pl 1: 85. 1753.

FIGURE 134

Annual; loosely tufted. Culms to 110 cm tall, usually erect, sometimes almost prostrate; nodes glabrous. Lower sheaths often completely surrounding the culms, glabrous or somewhat pilose; ligules 1–4 mm long; auricles to 8 mm long, well-developed even on the upper leaves; blades to 28 cm long, usually flat, occasionally with involute margins, glabrous or sparsely pilose, sometimes scabrous. Spikes 3–8 cm long, 7–16 mm wide, pale green to distinctly reddish, especially the awns; rachises disarticulating at maturity. Central spikelets sessile, florets sessile or pedicellate, pedicels to 2 mm long; glumes 11–25 mm long, 0.8–1.8 mm wide, flattened, margins usually distinctly ciliate; lemmas 8–14 mm long, to 2 mm wide, more or less smooth, awned, awns 20–40 mm; lodicules glabrous or with 1+ cilia; anthers 0.2–3.2 mm long, gray to yellow, sometimes with purple spots. Lateral spikelets staminate, floret sessile; glumes flattened, margins ciliate; lemmas 8–15 mm long, awned, awns 20–50 mm

long; paleas 8–15 mm long; rachillas 2.5–6.5 mm long, slender or gibbous, yellow.  $2n = 14, 28, 42$ .

**DISTRIBUTION AND HABITAT.** *Hordeum murinum* is native to Eurasia, where it is a common weed in areas of human disturbance. It is thought to have been introduced to the Western Hemisphere along seashores, sandy riverbanks, and animal watering holes. It is now an established weed in southwestern North America and other scattered locations.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Juárez:** en el Parque “El Chamizal”, maleza de prados & canales de riego [grass meadows and irrigation canals], 7 Sep 1995, 1120 m, *R. Corral* RCD6285 (UACJ); Univ. Autónoma de Cd. Juárez, Campus ICB, 15 Abr [Apr] 2005, 1118 m, *R. Corral, M. Vargas & D. Alvarado* RCD7102 (UACJ); Cd. Juárez, planta tratadora de agua [water treatment plant] entre la calle [between streets] Julia & Ana, Frac. Puerta del Sol, 26 Mar 1996, *P. Olivares & R. Durán* POS728 (UACJ). **Práxedes G. Guerrero** (San Ignacio): a 2 km al S del poblado del mismo nombre [village of the same name], Rancho Escuela de la Univ. Autónoma de Cd.



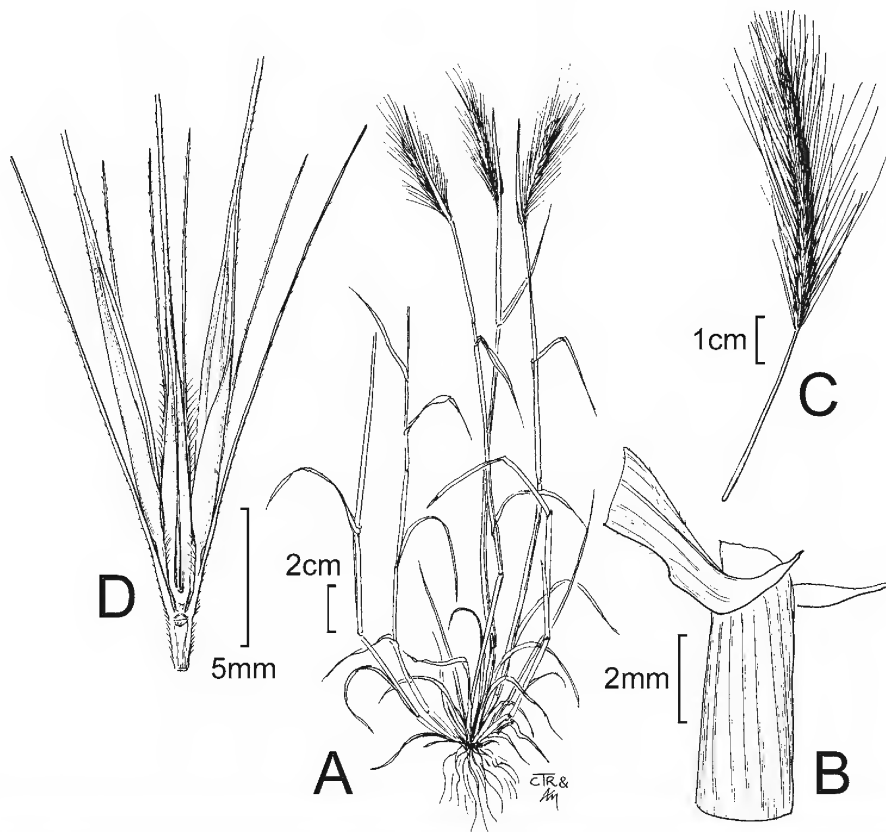


FIGURE 134. *Hordeum murinum*. A. Habit. B. Ligule and auricles. C. Inflorescence. D. Spikelet fascicle with three spikelets. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

Juárez, 18 Mar 1995, 1090 m, R. Corral, P. Olivas & E. Pérez RCD6029 (UACJ).

185. *Hordeum pusillum* Nutt., Gen. N. Amer. Pl. 1: 87. 1818.

Annual; loosely tufted. Culms 10–60 cm long, erect, geniculate, or ascending; nodes glabrous. Sheaths glabrous or slightly pubescent; ligules 0.2–0.8 mm long; auricles absent; blades to 10.5 cm long, to 4.5 mm wide, sparsely to densely pubescent on both sides. Spikes 2–9 cm long, 3–7 mm wide, erect, often partially enclosed at maturity, pale green. Glumes straight, not divergent at maturity. Central spikelets: glumes 8–17 mm long, 0.5–1.5 mm wide, distinctly flattened near the base; lemmas 5–8.5 mm long, usually glabrous, sometimes sparsely to densely pubescent, awned, the awns 3.5–9.5 mm long; anthers 0.7–1.8 mm long. Lateral spikelets usually sterile; glumes to 18 mm long; lower glumes distinctly flattened, more or less winged basally; lemmas 2.5–5.7 mm long, usually awned, awns to 1.8 mm long, rarely unawned; anthers 0.6–1.2 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Hordeum pusillum* grows in open grasslands, pastures, the borders of marshes,

and disturbed places such as roadsides and waste places, often in alkaline soil. It is native, widespread, and often common in much of the United States to northern Mexico, where it is uncommon.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: La Campana, 26 May 76, Jardines de observación [observation gardens], 1540 m, S. González 833 (RELC).

186. *Hordeum vulgare*\* L., Sp. Pl. 1: 84–85. 1753.

FIGURE 135

Plants summer or winter annual; loosely tufted. Culms to 100(150) cm long, usually erect; nodes glabrous. Lower sheaths pilose, upper sheaths glabrous, auricles to 6 mm long, well-developed even on the upper leaves; blades to 30 cm long, 5–15 mm wide, flat, scabrous or glabrous. Spikes 5–10 cm long, 0.8–2 cm wide, green to purplish or blackish; nodes 10–30, with 3 spikelets per node, 0–2 lateral spikelets, in addition to the central spikelets, forming seed at maturity (resulting in 2-, 4-, and 6-rowed barley); rachises usually not disarticulating at maturity.

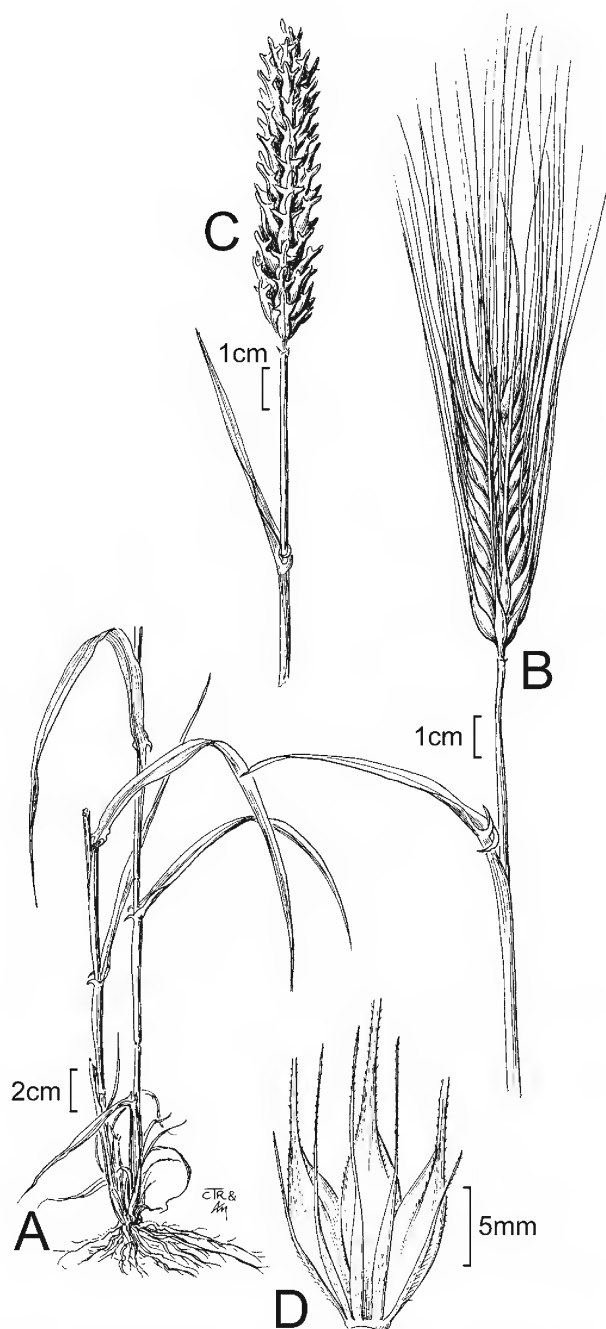


FIGURE 135. *Hordeum vulgare*. A. Habit. B. Inflorescence, awned form. C. Inflorescence, unawned form. D. Spikelet fascicle with three spikelets. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

Central spikelets sessile; glumes 10–30 mm long, pubescent, flattened near the base; lemmas 6–12 mm long, 3+ mm wide, glabrous, sometimes scabrous, particularly distally, unawned or awned, awns 30–180 mm long, usually scabrous; anthers 6–10 mm long, yellowish. Lateral spikelets usually sessile if seed-forming, pedicellate if sterile; pedicels up to 3 mm long; lemmas usually 6–15 mm long, awned when fertile, obtuse to acute when sterile.  $2n = 14$  (28).

**DISTRIBUTION AND HABITAT.** *Hordeum vulgare* is native to Eurasia. Plants in Mexico belong to the cultivated subspecies, *Hordeum vulgare* subsp. *vulgare*, and are found as an adventive in fields, roadsides, and disturbed habitats.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Práxedes G. Guerrero (San Ignacio): a 2 km al S del poblado del mismo nombre [village of the same name], Rancho Escuela de la Univ. Autónoma de Cd. Juárez, 18 Mar 1995, 1090 m, R. Corral, P. Olivas & E. Pérez RCD6032 (UACJ).

### *Imperata* Cirillo

Perennial; strongly rhizomatous. Culms mostly erect and unbranched, usually with 3–4 nodes. Leaves not aromatic; sheaths open, ciliate at the margins of the collars; ligules membranous; blades of the basal leaves linear to lanceolate, sometimes ciliate basally, those of the cauline leaves reduced. Inflorescences terminal, cylindrical to conical panicles with an evident rachis; rachises often with numerous long hairs; inflorescence branches usually shorter than the rachises, with spikelets in unequally pedicellate pairs; disarticulation below the glumes. Spikelets homogamous and homomorphic, unawned; calluses very short, hairy. Glumes equal to subequal, membranous, 3- to 9-veined, with hairs longer than the florets over at least the lower  $\frac{1}{2}$ ; lower florets reduced to hyaline or membranous lemmas; upper florets bisexual, lemmas, if present, hyaline, unawned; anthers 1–2, yellow to brown; stigmas elongate, purple to brown; styles connate or free. Pedicels not fused to the branch axes, terminating in cuplike tips. Caryopsis ovate to obovate, light to dark brown.  $\times = 10$ .

*Imperata* has 13 species and is widely distributed in warm regions of both hemispheres.

187. *Imperata brevifolia* Vasey, Bull. Torrey Bot. Club 13(2): 26. 1886.

FIGURE 136

Culms 51–129 cm tall. Ligules 0.7–2.9 mm long; blades 7–14 mm wide, linear to lanceolate, abaxial surfaces smooth, adaxial surfaces sometimes densely pilose basally, otherwise scabrous. Panicles 16–34 cm long, dense; lower branches 2–5 cm long, divergent. Spikelets with callus hairs 8–12 mm long; glumes 2.7–4.1 mm long; lower lemmas 2.5–3.9 mm long, membranous, glume-like; upper lemmas 1.4–2.4 mm long, completely surrounding the ovary; stamens 1, filaments dilated at the base; anthers 1.3–2.3 mm long, yellow to orange; styles 0.9–2.4 mm long; stigmas 2.1–4 mm long, purple to brown.  $2n = 20$ .

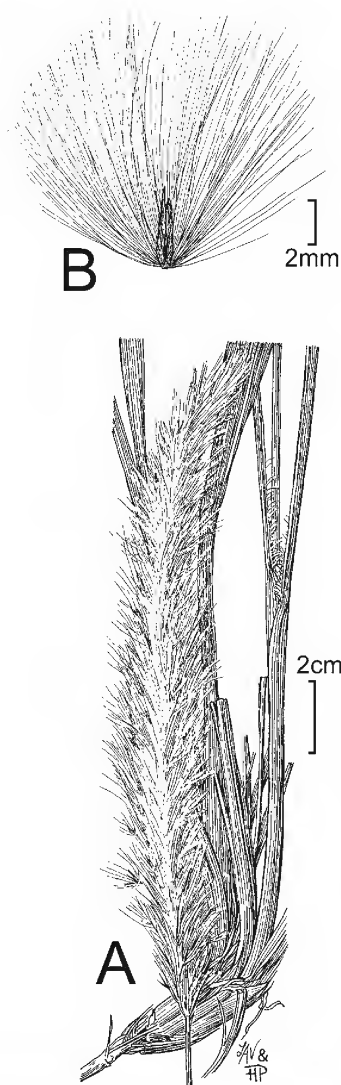


FIGURE 136. *Imperata brevifolia*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Imperata brevifolia* is native to wet or moist sites in the southwestern deserts of California, Nevada, and Utah to western Texas. Our only record of this species is a LeSueur collection (Mex-099), and we cannot verify its locality. We do know that his next number, Mex-0100 (*Andropogon glomeratus* var. *pumilus*), was collected on the same date and locality.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Rio Bonito hot country, 26 Aug 1936, *H. LeSueur* 099 (US).

### *Kalinia* H. L. Bell & Columbus

Robust perennial; with long, glabrous stolons and thick, tan to golden rhizomes with imbricate scales dehiscent to form distinctive scars. Culms erect; ligule a line of short hairs; leaf blades rigid, conspicuously orthodistichous, with markedly pungent tips. Inflorescence a narrow to open panicle. Spikelets with 4–12-hermaphroditic florets, the distal floret occasionally reduced; lemmas 3-veined, glabrous, with an obtuse to slightly pointed tip, sometimes erose, fringed, or mucronate from the central vein.

*Kalinia* is a new monotypic genus and subtribe to house *Eragrostis obtusiflora* (E. Fourn.) Scribn., a long-misplaced species that is sister to the Monanthochloinae + Boutelouinae (Bell et al., 2012; Peterson and Valdés-Reyna, 2005; Peterson et al., 2016, 2017).

188. *Kalinia obtusiflora* (E. Fourn.) H. L. Bell & Columbus, *Aliso* 30(2): 91. 2012. *Brizopyrum obtusiflorum* E. Fourn., *Mexic. Pl.* 2: 120. 1886. *Eragrostis obtusiflora* (E. Fourn.) Scribn., *Bull. Div. Agrostol. U.S.D.A.* 8: 10, t. 5. 1897.

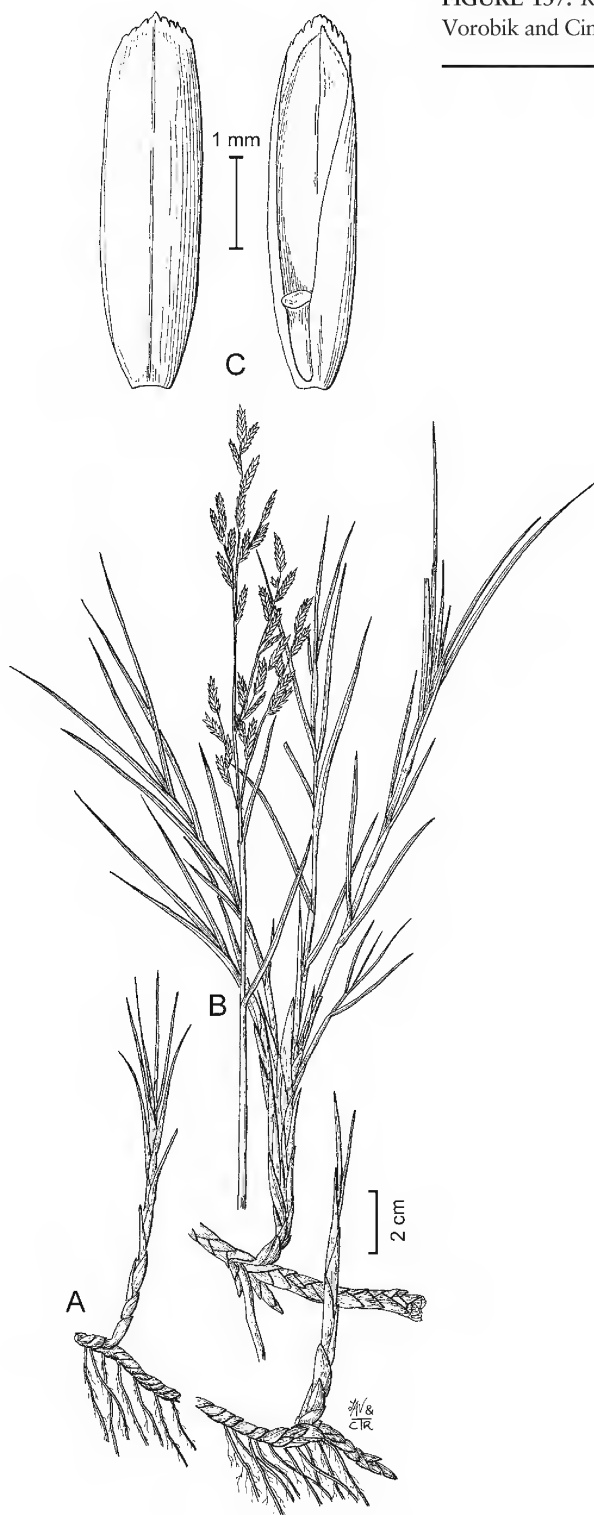
FIGURE 137

Perennial; with scaly, sharp-pointed rhizomes, with innovations, sometimes stoloniferous, the sharp-tipped rhizomes 4–8 mm thick. Culms 15–40(50) cm tall, stiff, hard, glaucous below the nodes. Sheaths hairy at the apex, hairs to 2 mm; ligules 0.2–0.4 mm long; blades 2–15 cm long, (1)2–4 mm wide, involute, arcuate, glabrous abaxially, scabrous adaxially, apex sharply pointed. Panicles 6–20(24) cm long, 2–8(12) cm wide, ovate, open or contracted; primary branches 1–8(15) cm long, appressed or diverging up to 50° from the rachises; pulvini glabrous or not; pedicels 0–8 mm long, appressed, lower pedicels on each branch shorter than 1 mm long. Spikelets 8–14 mm long, 1.4–3 mm wide, ovate to lanceolate, stramineous with a reddish-purple tinge; disarticulation basipetal, glumes persistent; glumes unequal, chartaceous; lower glumes 2.4–3.6 mm long; upper glumes 3–4.5 mm long, sometimes 3-veined; lemmas 3.8–4.5 mm long, ovate, leathery, lateral veins evident, greenish, upper margins hyaline, apex acute to obtuse, usually erose; paleas 3.8–4.5 mm long, membranous, keels scabrous, apex obtuse to truncate; stamens 3; anthers 2–2.4 mm long, purplish to yellowish. Caryopsis 1.6–2 mm long, ellipsoid, dorsally flattened, with a shallow adaxial groove, striate, reddish-brown.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Kalinia obtusiflora* is native to the southwestern United States and Mexico. It grows in dry or wet alkali flats, often in association with *Distichlis spicata*, at 900–1,400 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Ascensión: Laguna Ascension, near La Ascension, 13 Sep 1939, *L. H. Harvey* 1750 (US). Chihuahua: La Campana, Potrero La Reserva; 12 km carr. [hwy] Panamericana, 25 Aug 73, pastizal halófito abierto [open halophyte grassland], 1480 m, *Valdés-Reyna* VR-08 (RELC). Galeana: 4 mi NW of Galeana, 2 Sep

FIGURE 137. *Kalinia obtusiflora*. A. Rhizome. B. Habit. C. Florets. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.



1958, alkali flat, 1524 m, *Reeder & C. Reeder* 3201 (ENCB). **Hidalgo del Parral:** 13 mi N of Parrita, 16 Sep 1960, alkali flat in desert pastizal–Mesquite area, 4800 ft, *Reeder, C. Reeder & Soderstrom* 3489 (ARIZ, ENCB).

### ***Koeleria* Pers.**

Perennial; usually caespitose, sometimes short rhizomatous. Culm erect. Sheaths open; auricles absent; ligules membranous; blades flat to involute, pubescent or glabrous. Inflorescences panicles, usually dense and spikelike, sometimes lax, stiffly and narrowly pyramidal at anthesis; main rachis and branches pubescent. Spikelets laterally compressed, with 2–4 florets; rachillas to 1 mm long, glabrous or pubescent, usually prolonged beyond the distal florets, or bearing a vestigial floret; disarticulation above the glumes and beneath the florets. Glumes subequal to or slightly exceeding the lemmas, membranous, scabrous to tomentose, keels sometimes ciliate; lower glumes 1-veined, somewhat narrower and shorter than the upper glumes; upper glumes obscurely 3(5)-veined; calluses with or without hairs; lemmas thin, membranous, 5-veined, margins shining, scarious, apex acute, sometimes mucronate or awned; paleas equaling or subequal to the lemmas, hyaline; lodicules 2, glabrous, toothed; anthers 3; ovaries glabrous. Caryopsis glabrous.  $x = 7$ .

*Koeleria* is a cosmopolitan genus of about 49 species that grow in dry grasslands and rocky soils; a single species is native to North America.

189. *Koeleria pyramidata* (Lam.) P. Beauv., Ess. Agrostogr. 84: 166, 175. 1812. *Poa pyramidata* Lam., Tabl. Encycl. 1: 183. 1791.

*Koeleria macrantha* (Ledeb.) Schult., *Koeleria cristata* Pers., *Koeleria californica* (Domin) Beetle.

FIGURE 138

Plants loosely caespitose, sometimes rhizomatous. Culms (20)20–90(130) cm tall, glabrous or puberulent above. Sheaths sparsely sericeous to densely pubescent, old sheaths persistent, disintegrating into wavy, curled, or arched fibers; ligules 0.5–2 mm long; blades 2–24 cm long, (0.5)1–5 mm wide, flat, often involute when dry, glabrous or hairy, scaberrulous, margins of the basal blades often ciliate below, with hairs usually more than 2 mm. Panicles 4–27 cm long, (0.5)1–3(5) cm wide; branches finely pubescent to villous. Spikelets 2.5–10 mm long, with 2–4(5) florets; rachillas with scattered pubescence; glumes 2.5–6 mm long, glabrous, smooth or scabrous, apex acute; lower glumes 2.5–5 mm long, 1-veined; upper glumes generally



FIGURE 138. *Koeleria pyramidata*. A. Habit. B. Inflorescence branches. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

4–6 mm long, 3-veined; calluses broadly rounded, pubescent; lemmas (2.5)4–6.5 mm long, glabrous or puberulent, rarely ciliate, sometimes scabrous, green when young, stramineous at maturity, sometimes purplish-tinged, apex acuminate to mucronate; anthers 1–2.5(3) mm long. Caryopsis 2.5–3.8 mm long.  $2n = 14, 28$ .

*Koeleria pyramidata*, as interpreted here, is a highly polymorphic species complex and has been treated as *Koeleria pyramidata* subsp. *pyramidata* by Quintanar and Castroviejo (2014), who studied the genus in the western Mediterranean Basin and Macaronesia. They found variability in organ size and hairiness. In addition, we have preliminary DNA sequence data (P. Barberá at Real Jardín Botánico, and K. Romaschenko, P. M. Peterson and R. J. Soreng at Smithsonian Institution; unpublished) confirming the highly variable nature of accessions previously referred to as *K. pyramidata* or *K. macrantha*.

**DISTRIBUTION AND HABITAT.** *Koeleria pyramidata* is widely distributed in temperate regions of North America and Eurasia. In North America it grows in semi-arid to mesic conditions on dry prairies or in grassy woods, generally in sandy soil, at 1,500–3,900 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon-juniper woodlands, 2110 m, P.M. Peterson & Annable 12549 (US). **Batopilas:** 16.1 km E of jct to Batopilas on road to Guachochi, 13 Sep 1989, pine forest, 2500 m, P.M. Peterson, Annable & Y. Herrera 8074 (ENCB, US); P.M. Peterson, Annable & Y. Herrera 974 (CIIDIR). **Madera:** near Col. García, 1–20 Aug 1899, E.W. Nelson 6198 (US). **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20045, F.Sánchez Alvarado & E.P. Gómez Ruiz (CIIDIR, US).

### ***Lasiacis* (Griseb.) Hitchc.**

Perennial (rarely annual); caespitose. Culms weakly lignified, erect, arching, climbing, or decumbent, rooting at the nodes. Sheaths open; ligules membranous, sometimes ciliate; pseudopetioles sometimes present; blades linear to ovate, bases slightly to strongly asymmetric. Inflorescences open or contracted panicles, rachises usually visible, even distally, spikelets attached obliquely to the pedicels; disarticulation below the glumes. Spikelets subglobose to globose, with 2 florets. Glumes membranous, apex lanate pubescent, abruptly apiculate; lower glumes  $\frac{1}{3}$ – $\frac{2}{3}$  as long as the spikelets, 5- to 13-veined, bases saccate, margins overlapping; upper glumes about as long as the upper florets, not saccate, 7- to 15-veined; lower florets sterile or staminate; lower lemmas membranous, apex lanate pubescent, abruptly apiculate; lower paleas present, sometimes reduced; upper florets stipitate, bisexual, appearing to be mucronate or acuminate; upper lemmas indurate, usually broadly elliptic to obovate, margins enclosing the edges of the paleas, apex obtuse, somewhat woolly pubescent, usually dark brown at maturity; upper paleas similar to the lemmas, but saccate below



and gibbous above. Caryopsis plano-convex, ovoid, or nearly orbicular; embryo about  $\frac{1}{2}$  as long as the caryopsis; hila oblong to nearly round.  $x = 9$ .

*Lasiacis* is a neotropical genus of 17 species that extends from southern Florida to Peru and Argentina; it is uncommon in Mexico.

190. *Lasiacis ruscifolia* (Kunth) Hitchc., Proc. Biol. Soc. Washington 24: 145. 1911. *Panicum ruscifolium* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 101–102. 1815.

FIGURE 139

Caespitose perennial. Culms 1–8 m long, 5–12 mm thick, hollow, arching or clambering. Sheaths glabrous, puberulent, or hirsute with papillose-based hairs, margins ciliate; ligules 0.2–1 mm long, glabrous or ciliate; blades 2–16 cm long, 8–56 mm wide, ovate to ovate-lanceolate. Panicles 2–22 cm long; lower branches to 9 cm long, divergent. Spikelets 2.6–4 mm long, globose; lower glumes 1.2–2.2 mm long, 9- to 13-veined; lower florets sterile; upper glumes 11- to 13-veined; upper florets 2.8–3.6 mm long, 2–2.9 mm wide, dark brown to grayish-black at maturity; upper lemmas usually with a distinct shelf at the base, from which a sterile projection often arises; upper paleas usually deeply concave; anthers 1.4–2.3 mm long, white; stigmas white. Caryopsis 2–2.5 mm long.  $2n = 36$ .



FIGURE 139. *Lasiacis ruscifolia*. A. Habit. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Lasiacis ruscifolia* extends from southern Florida to Peru.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 10, 10/519 (US); 2.5 km de Satevo en brecha [gap] a San José, 12 Sep 2003, P. tenorio, J. Rodríguez, M. Hilerio & E. Zarate 23278 (US). **Guazapares:** among rocks at Temoris station on Chihuahua al Pacifico RR, 7 Aug 1964, 1025 m, I.W. Knobloch 2087 (ENCB). **Uruachi:** Guasaremos, Río Mayo, 20 Aug, 1936, Gentry 2402 (US).

### *Leersia* Sw.

**Plants** usually perennial, rarely annual; terrestrial or aquatic; rhizomatous or caespitose; synoecious. **Culms** erect or decumbent, often rooting at the nodes, branched or unbranched. **Leaves** equitably distributed along the culm; **sheaths** open; **auricles** absent; **ligules** membranous; **pseudopetioles** absent; **blades** aerial, linear to broadly lanceolate, flat or folded, sometimes involute when dry. **Inflorescences** terminal panicles, usually exserted, axillary panicles sometimes also present; **disarticulation** beneath the spikelets. **Spikelets** bisexual, with 1 floret; **florets** laterally compressed, linear to suborbicular in sideview; **glumes** absent; **calluses** not stipelike, glabrous; **lemmas** and **paleas** subequal, chartaceous to coriaceous, ciliate-hirsute or glabrous, tightly clasping along the margins; **lemmas** 5-veined, obtuse or acute to acuminate, sometimes mucronate, usually unawned; **paleas** 3-veined, unawned; **lodicules** 2; **anthers** 1, 2, 3, or 6; **styles** 2, bases fused, stigmas laterally exserted, plumose. **Caryopsis** laterally compressed; **embryos** about  $\frac{1}{3}$  as long as the caryopsis; **hila** linear.  $x = 12$ .

*Leersia* is a genus of about 18 aquatic to mesophytic species, growing primarily in tropical and warm-temperate regions. Five species are native to North America, and three are found in Mexico.

191. *Leersia hexandra* Sw. Prodr. 21. 1788.

FIGURE 140

**Perennial;** rhizomatous, rhizomes elongate, not scaly. **Culms** 25–150 cm tall, 1–1.5 mm thick, decumbent, rooting at the nodes, terminal portions erect, often floating, branched or unbranched; **nodes** pubescent, adjacent portions of the internodes glabrous or coarsely scabrous. **Sheaths** glabrous or coarsely scabrous, margins often ciliate; **ligules** 1–3 mm long; **blades** 5–25 cm long, 3–15 mm wide, ascending, glabrous or pubescent. **Panicles** 5–15 cm long, exserted at maturity, with 1(2) branches per node; **branches** 3–10 cm long, appressed to ascending, spikelet-bearing to near the base, spikelets appressed to slightly divergent, slightly imbricate. **Spikelets** 3.2–4.7(5) mm long, 0.5–2 mm wide, ovate to elliptic. **Lemmas** ciliate on the keels and margins, short hirsute or glabrous elsewhere, apex acute to acuminate; **paleas** ciliate on the keels; **stamens** 6, anthers 2–3.2 mm long. **Caryopsis** about 2 mm long, usually not developed.  $2n = 48$ .



FIGURE 140. *Leersia hexandra*. A. Culm and inflorescence. B. Two spikelets. Drawn by Linda Ann Vorobik; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Leersia hexandra* is found in wet areas, usually in freshwater along streams and ponds, where it sometimes forms floating mats. It grows in the Americas throughout much of the neotropics.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

### ***Leptochloa* P. Beauv.**

Perennial; caespitose, sometimes stoloniferous. Culms herbaceous, solid, glabrous. Sheaths open, rounded; ligules membranous, ciliate, cilia longer than the membranous base, conspicuous tufts of stiff hairs present on either side of the ligules; blades linear, flat or folded. Inflorescences terminal, panicles of nondisarticulating spikelike branches, exceeding the leaves; branches in 1 or more whorl(s), spikelets in 2 rows on the abaxial side of the branches, axes terminating in a functional spikelet. Spikelets laterally or dorsally compressed, with 2–5 florets, lowest 1–2 florets bisexual, distal 1–3 florets progressively reduced and sterile; disarticulation above the glumes, all the florets falling as a unit; glumes much shorter than the spikelets, membranous; lower glumes linear, acuminate; upper glumes lanceolate-ovate, awned; calluses bearded; lowest lemmas linear-lanceolate, 3-veined, veins prolonged into 3 awns; central awns longer than lateral awns; paleas 2-keeled, acute; distal floret(s) 1- to 3-awned; lodicules 2; anthers 2 or 3. Caryopsis sulcate; embryos  $\frac{1}{2}$  as long as the caryopsis; hila punctate.  $x = 10$ .

*Leptochloa* has seven species, two of them are native to the Americas (Peterson et al., 2015). Both species of *Leptochloa* in Chihuahua have a disjunct distribution with populations in North America being widely separated from those in South America.

### KEY TO SPECIES OF *LEPTOCHLOA*

1. Lowest lemma awns subequal, the central awns 8–12 mm long, equaling or slightly longer than the lateral awns ..... *L. crinita*
1. Lowest lemma awns unequal, the central awns 8–12 mm long, the lateral awns 0.5–1.5 mm long ..... *L. pluriflora*

192. *Leptochloa crinita* (Lag.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1327. 2012. *Chloris crinita* Lag., Varied. Ci. 2(4): 143. 1805. *Trichloris crinita* (Lag.) Parodi, Revista Argent. Agron. 14(1): 63. 1947.

Perennial; caespitose, sometimes stoloniferous. Culms to 100 cm tall. Sheaths glabrous or sparsely hirsute; ligules to 3 mm; blades to 20 cm long, 5–10 mm wide, scabrous. Panicles with 6–20 branches in several closely spaced whorls, appearing as a single terminal cluster; branches to 15 cm long, erect, with 7–9

spikelets per cm. Spikelets with 1 bisexual and 1(2) sterile floret(s); lower glumes 0.8–1.1 mm long; upper glumes 2–2.5 mm long, awned, awns to 2 mm; lowest lemmas 2.4–3.8 mm long, about 0.5 mm wide, narrowly lanceolate to elliptic, scabrous, particularly distally, apex bilobed and 3-awned, central awns 8–12 mm long, equaling or slightly longer than the 5–12 mm lateral awns; first sterile florets 1–1.5 mm long, narrowing to 3 subequal 5–7 mm awns; second sterile florets, if present, similar but smaller. Caryopsis 1.7–2.3 mm long, strongly dorsally flattened.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Leptochloa crinita* is a native species that grows in the southwestern United States and northern Mexico, and it is disjunct in northern Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6482 (UACJ). **Chihuahua:** Valley near Chihuahua, 20 Sep 1885, C.G. Pringle 475 (US); near El Carmen, 10 Oct 1935, LeSueur Mex-070 (US). **Jiménez:** Western margin of the Laguna de Palomas, 18 Aug 1972, 1230 m, F. Chiang, T. Wendt, & M.C. Johnston 8652 (MEXU). **Juárez:** Medanos de Samalayuca, 13 Oct 1997, km 70, I. Enriquez, S. Ordoñez & J. Leyva IEA21 (UACJ). **Meoqui:** In town of Meoqui, along hwy 45, SE of city of Chihuahua, 25 Sep 2004, 1140 m, R.M. King & R.M. Garvey 13463 (CIIDIR).

193. *Leptochloa pluriflora* (E. Fourn.) P. M. Peterson & N. Snow, Ann. Bot. 109: 1327. 2012. *Trichloris pluriflora* E. Fourn., Mexic. Pl. 2: 142. 1886. *Chloris pluriflora* (E. Fourn.) Clayton, Kew Bull. 21: 102. 1967.

Perennial; stoloniferous or caespitose. Culms to 150 cm tall. Sheaths glabrous or sparsely hirsute; ligules to 3 mm; blades to 30 cm long, to 10 mm wide, scabrous or sparsely hirsute. Panicles with 7–20 branches in a few, evidently separate whorls; branches to 20 cm long, ascending, with 7–9 spikelets per centimeter. Spikelets with 1–2 bisexual florets, a third floret with a rudimentary pistil and stamens sometimes present below the (1)2–3 sterile florets; lower glumes 2–3 mm long; upper glumes 3–5 mm long; lowest lemmas 3–5 mm long, mostly glabrous, margins short-ciliate near the middle, sparsely scabrous distally, apex 3-awned, central awns 8–12 mm long, lateral awns 0.5–1.5 mm long; lowest sterile florets 1.5–3 mm long, about 0.3 mm wide, mostly glabrous, margins sometimes short-ciliate near the middle, apex 3-awned, central awns to 8 mm long, lateral awns mucronate. Caryopsis 1.8–2.2 mm long, strongly dorsally compressed to trigonous in transverse section.  $2n = 80$ .

**DISTRIBUTION AND HABITAT.** *Leptochloa pluriflora* is native from southern Texas to Guatemala and disjunct in Ecuador to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

## **Lolium L.**

**Annual** or perennial; caespitose, sometimes short rhizomatous. Culms slender to stout, erect to decumbent, rarely prostrate. Sheaths open, rounded, glabrous, sometimes scabrous; ligules membranous, glabrous; auricles sometimes present; blades flat, linear. Inflorescences distichous spike-like or paniculate. Inflorescence a spike, with solitary spikelets oriented edgewise to the rachis, perpendicular to the rachis concavities or panicles, open and much branched. Spikelets laterally compressed, with 2–22 florets, distal florets reduced; rachillas glabrous; disarticulation above the glumes. Glumes usually 1 or 2, lanceolate to oblong, rounded over the midvein, membranous to indurate, 3- to 9-veined, unawned; lower glumes absent from all but the terminal spikelet in plants with spike inflorescences or both glumes present in plants with open panicles; calluses short, blunt, glabrous or sparsely hairy; lemmas lanceolate, ovate or oblong, rounded over the midvein, membranous, chartaceous, 3- to 7-veined, apex sometimes hyaline, unawned or awned, awns subterminal, more or less straight; paleas membranous, usually smooth, keels ciliate; lodicules 2, free, lanceolate to ovate; anthers 3; ovaries glabrous. Caryopsis dorsally compressed, oblong, broadly elliptic or ovate, longitudinally sulcate; hila linear, in the furrow; embryos  $\frac{1}{5}$ – $\frac{1}{3}$  as long as the caryopsis.  $x = 7$ .

*Lolium* comprises 11 species that are native to Europe, temperate Asia, and northern Africa. All have been introduced to North America, often as forage grasses.

## **KEY TO SPECIES OF LOLIUM**

1. Inflorescence an open panicle with numerous branches; all spikelets with 2 well-developed glumes; summit of leaf sheaths with auricles . . . . . *L. arundinaceum*
1. Inflorescence a spike with solitary spikelets oriented edgewise to the rachises; most spikelets, except the very terminal ones, with a single glume; summit of leaf sheaths without auricles.
  2. Plants long-lived perennials; 2–10 florets per spikelet; lemmas unawned or awned, awns to about 8 mm long . . . . . *L. perenne*
  2. Annual or short-lived perennials; 10–22 florets per spikelet; lemmas usually awned, awns to 15 mm long, rarely unawned . . . . . *L. multiflorum*

194. *Lolium arundinaceum*\* (Schreb.) Darbysh., Novon 3(3): 241. 1993. *Festuca arundinacea* Schreb., Spic. Fl. Lips. 57. 1771. *Schedonorus arundinaceus* (Schreb.) Dumort., Observ. Gramin. Belg. 106. 1824.

FIGURE 141

**Perennial;** sometimes rhizomatous. Culms to 1.5(2) m tall. Leaves convolute in young shoots; auricles ciliate, having at

least 1 or 2 hairs along the margins; ligules 1(2) mm long; blades 11–30 cm long, 4–12 mm wide. Panicles 10–35 cm; branches at the lowest node usually 2, shorter branch with (1)2–9(13) spikelets, longer branch with (3)4–13(19) spikelets. Spikelets 8–15.5 mm long, 2–3.5 mm wide, with 3–6(9) florets; lower glumes 3–6 mm long; upper glumes 4.5–7(9) mm long; lemmas (4)5–9(11.5) mm long, usually scabrous or hirsute, at least distally, rarely smooth, awns absent or to 4 mm long, terminal or

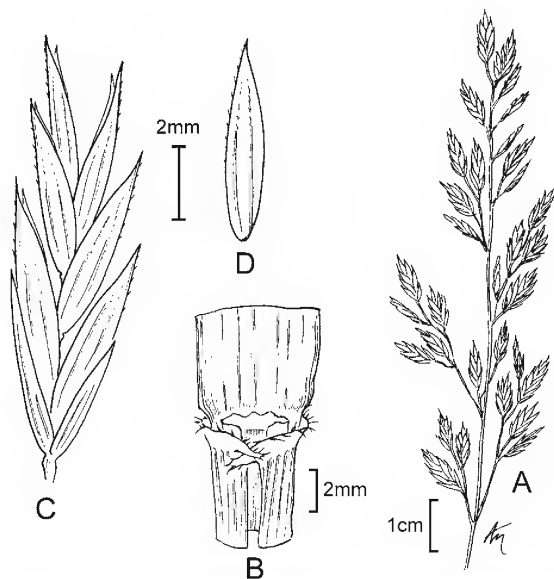


FIGURE 141. *Lolium arundinaceum*. A. Inflorescence. B. Ligule. C. Spikelet. D. Lemma. Drawn by Annaliese Miller; copyright Utah State University.

attached up to 0.4 mm below the apex; **paleas** slightly shorter than to slightly longer than the lemmas; **anthers** 2.5–4 mm long. **Caryopsis** 2–4 mm long, 0.9–1.6 mm wide.  $2n = 28, 42, 56, 63, 70$ .

**DISTRIBUTION AND HABITAT.** *Lolium arundinaceum* is a Eurasian species that has been introduced to *North America*. It is grown for forage, soil stabilization, and coarse turf. It is now cultivated in all but the coldest and most arid parts of North America and often escapes.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ocampo:** Near Mirador de Cascada de Basaseachic, 7 Sep 2008, slopes with *Pinus*, 2022 m, P.M. Peterson & J.M. Saarela 22100 (US).

195. *Lolium multiflorum*\* Lam., Fl. Franc. 3: 621. 1779.

FIGURE 142

**Annual** or short-lived perennial. **Culms** to 150 cm. **Leaves** rolled in the bud; **blades** usually 10–30 cm long, (2)3–8 (13) mm wide. **Spikes** 15–45 cm long, with 5–38 spikelets; **rachises** 0.8–2 mm thick at the nodes, not flexuous. **Spikelets** 8–31 mm long, 2–10 mm wide, with (10)11–22 florets; **glumes** 5–18 mm long,  $\frac{1}{4}$ – $\frac{1}{2}$  as long as the florets, membranous to indurate; **lemmas** 4–8.2 mm long, 1–2 mm wide, usually awned, awns to 15 mm long, attached 0.2–0.7 mm below the apex, rarely unawned; **paleas** shorter than to slightly longer than the lemmas; **anthers**

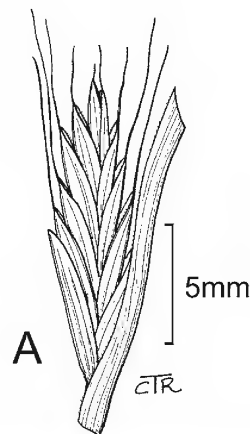
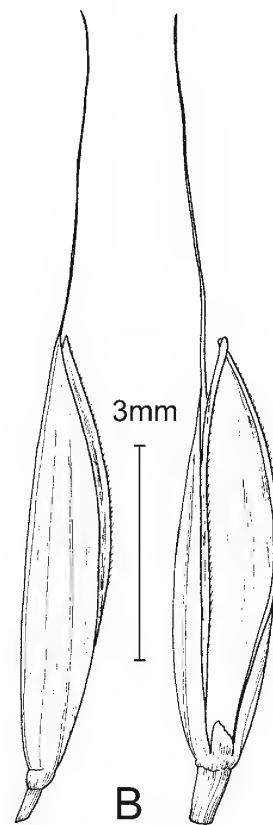


FIGURE 142. *Lolium multiflorum*. A. Spikelet. B. Florets. Drawn by Cindy Roché; copyright Utah State University.

(2.5)3–4.5(5) mm long. *Caryopsis* 2.5–4 mm long, 0.7–1.5 mm wide, 3 or more times longer than wide.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Lolium multiflorum*, a European species, now grows in most of North America. It is planted as a cover crop, as a temporary lawn grass, for roadside restoration, and for soil or forage enrichment; it often escapes from cultivation, becoming established in disturbed sites.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: La Campana, Ojo del Arco, 11 Sep 1973, 1500 m, *Valdés-Reyna* VR-188 (ENCB, RELC); Rancho Experimental La Campana, Jardín de observación de zacates [grass observation garden], 17 May 1975, 1500 m, *Valdés-Reyna* VR-902 (ENCB, RELC).

196. *Lolium perenne*\* L., Sp. Pl. 1: 83. 1753.

FIGURE 143

Plants long-lived perennial. Culms to 100 cm. Leaves folded in the bud; blades usually 10–30 cm long, (1)2–4(6) mm wide. Spikes 3–30 cm long, with 5–37 spikelets; rachises 0.5–2.5 mm thick at the nodes, often flexuous. Spikelets 5–22 mm long, 1–7 mm wide, with (2)5–9(10) florets; glumes 3.5–15 mm long,  $(\frac{1}{3})\frac{1}{2}$ – $\frac{3}{4}$  as long as to slightly exceeding the distal florets, membranous to indurate; lemmas 3.5–9 mm long, 0.8–2 mm wide, unawned or awned, awns to about 8 mm long, attached 0.2–0.7 mm below the apex; paleas shorter than to slightly longer than the lemmas; anthers 2–4.2 mm long. *Caryopsis* 3–5.5 mm long, 0.7–1.5 mm wide, 3 or more times longer than wide.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Lolium perenne*, a Eurasian species, is now established in disturbed areas throughout much of North America. It is commercially important, being included in lawn seed mixtures as well as being used for forage and erosion prevention.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. *Práxedes G. Guerrero* (San Ignacio): a 2 km al S del poblado del mismo nombre [village of the same name], Rancho Escuela de la Univ. Autónoma de Cd. Juárez, 5 May 1995, 1090 m, *R. Corral*, *P. Olivas*, *E. Pérez*, *K. Chico* & *A. Soutyrine* RCD6078 (UACJ); Rancho Escuela, 16 Aug 1997, *I. Enriquez*, *S. Ordoñez*, *L. Sushii*, *S. Carrasco*, *A. Perales* & *N. Loya* IEA7 (UACJ).

**Luziola Juss**

Perennial; aquatic, usually rooted, sometimes floating; stoloniferous, sometimes mat-forming; monoecious. Culms erect or prostrate, sometimes rooting at the nodes, branched, emergent or immersed. Leaves cauline; sheaths open, not inflated or somewhat inflated; ligules hyaline; pseudopetioles present or absent; blades flat, linear to lanceolate or narrowly elliptic, glabrous, pubescent, or scabrous. Inflorescences panicles, racemes, or spikes, exserted or enclosed, staminate and pistillate spikelets usually in separate inflorescences, pistillate inflorescences at the lower or middle nodes, staminate inflorescences

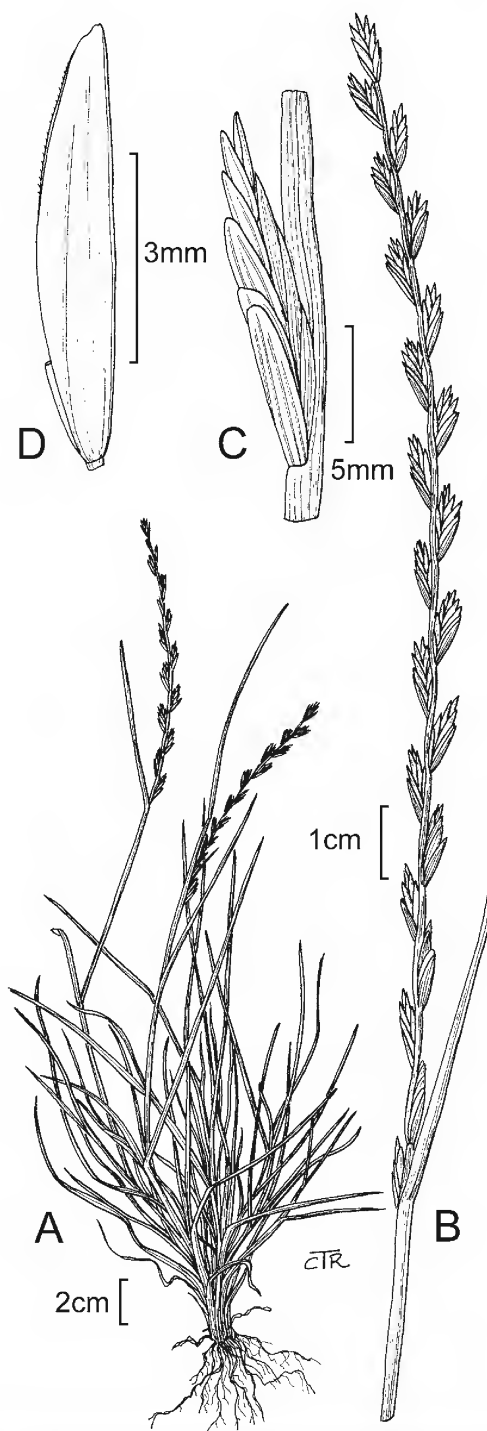


FIGURE 143. *Lolium perenne*. A. Habit. B. Inflorescence. C. Spikelet. D. Floret. Drawn by Cindy Roché; copyright Utah State University.



usually terminal; **disarticulation** below the spikelets. **Spikelets** unisexual, laterally compressed to subterete, with 1 floret; **glumes** absent; **calluses** glabrous; **lemmas** and **paleas** subequal, ovate or lanceolate, membranous or hyaline, unawned; **lodicules** 2; **staminate lemmas** and paleas obscurely few- to several-veined; **anthers** 6–16; **pistillate lemmas** 5- to 14-veined, margins not clasping the margins of the paleas, unawned; **paleas** 3- to 10-veined; **styles** 2, bases fused, stigmas laterally or terminally exserted, plumose. **Fruits** achenes, ovoid, ellipsoid, or subglobose, beaked by the persistent style bases; **pericarp** shell-like, partially free from the seed, smooth or striate, crustaceous; **seeds** ovoid to subglobose; **embryos** basal; **hila** linear.  $x = 12$ .

*Luziola* is a genus of 11 species that range from the southeastern United States to Argentina (Clayton et al., 2006). Only *L. fluitans* is native to North America.

197. *Luziola fluitans* (Michx.) Terrell & H. Rob., Bull. Torrey Bot. Club 101(5): 244. 1974. *Zizania fluitans* Michx., Fl. Bor.-Amer. 1: 75. 1803.

*Hydrochloa caroliniensis* P. Beauv.

FIGURE 144

**Plants** stoloniferous; mostly immersed. **Culms** to 1+ m long, to 2 mm thick; bases prostrate and rooting at the nodes. **Leaves** mainly cauline, usually crowded distally, streaming in the current

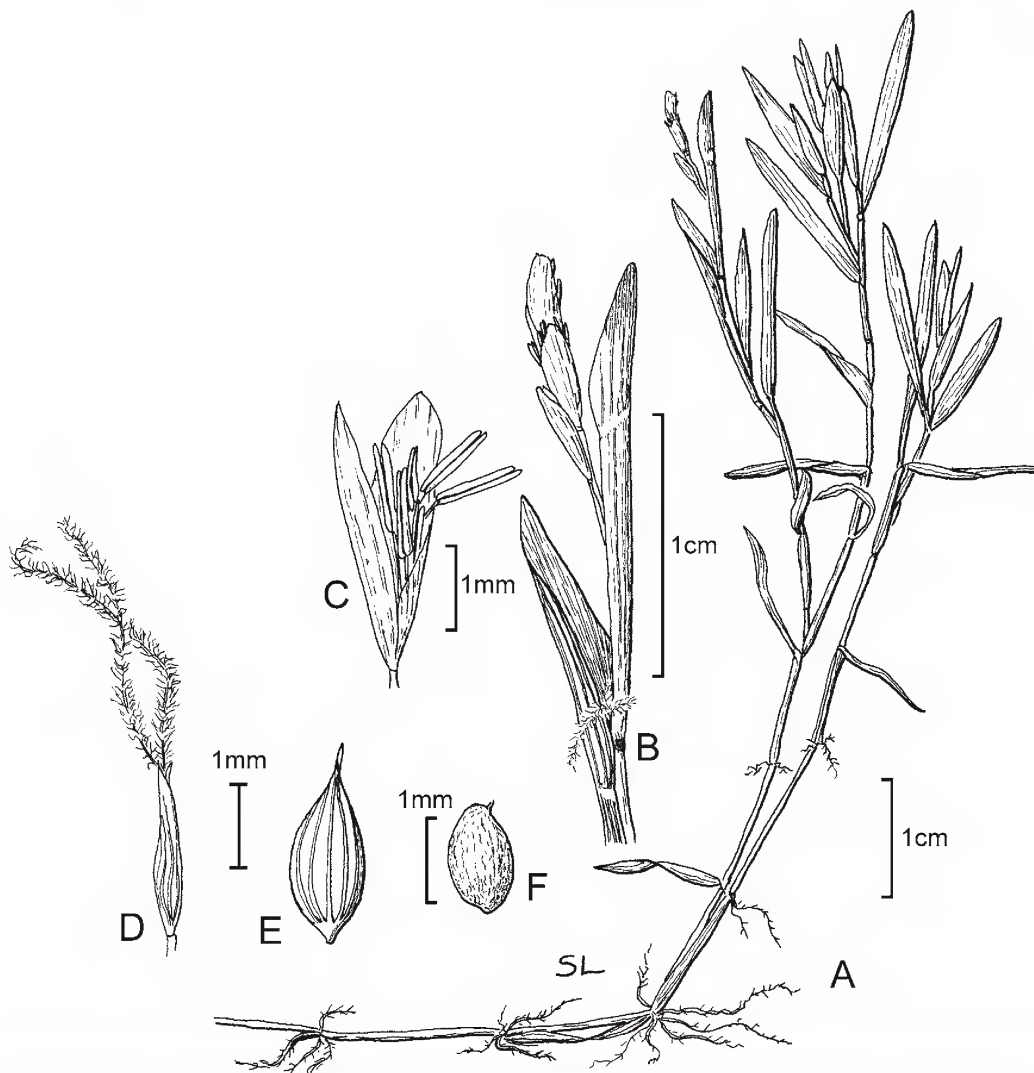


FIGURE 144. *Luziola fluitans*. A. Habit. B. Culm. C. Staminate floret. D. Immature pistillate floret. E. Mature pistillate floret. F. Achene. Drawn by Sandy Long; copyright Utah State University.

or floating on the surface, distal leaves sometimes emergent; **sheaths** glabrous; **ligules** 0.5–2 mm long, subtriangular to truncate, sometimes erose; **pseudopetioles** sometimes present; **blades** 1–5(8) cm long, 1–4 mm wide, glabrous, sometimes pilose basally, scaberulous. **Inflorescences** spikes or racemes, spikelets sessile or shortly pedicellate. **Staminate inflorescences** 1–2 cm long, terminal, partially exerted from the sheaths, emergent at anthesis, with 2–4 spikelets; **staminate florets** 3–5 mm long; **lemmas** narrowly ovate, usually 5-veined; **paleas** similar, usually 3-veined; stamens 6, anthers 2–3.7 mm long, linear. **Pistillate inflorescences** 0.5–2 cm long, mostly included in the subtending sheaths, only the stigmas visible, with 2–4 spikelets; **pistillate florets** 1.4–3 mm long, caducous; **lemmas** 5- to 9-veined, acuminate; **paleas** similar to the lemmas, 3- to 7-veined; **stigmas** 3–6 mm long. **Achenes** 1.3–2 mm long, ovoid, asymmetrical, minutely striate, lustrous.  $2n = 24$ .

**DISTRIBUTION AND HABITAT.** *Luziola fluitans* grows in fresh to slightly saline lakes and streams in the southeastern United States and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

### *Melica* L.

**Perennial**; caespitose or soboliferous, not or only short rhizomatous. **Culms** sometimes forming a basal corm; **nodes** and

**internodes** usually glabrous. **Sheaths** closed almost to the top; **auricles** sometimes present; **ligules** thinly membranous, erose to lacerate, usually glabrous, those of the lower leaves shorter than those of the upper leaves; **blades** flat or folded, glabrous or hairy, particularly on the adaxial surfaces, sometimes scabrous. **Inflorescences** terminal panicles; **primary branches** often appressed; **secondary branches** appressed or divergent; **pedicels** either more or less straight or sharply bent below the spikelets, scabrous to strigose distally; **disarticulation** below the glumes in species with sharply bent pedicels, above the glumes in other species. **Spikelets** with 1–7 bisexual florets, terminating in a sterile structure, the *rudiment*, composed of 1–4 sterile florets; **rudiments** sometimes morphologically distinct from the bisexual florets, sometimes similar but smaller; **glumes** chartaceous or papery, distal margins wide, translucent; **lower glumes** 1- to 9-veined; **upper glumes** 1- to 11-veined; **calluses** glabrous; **lemmas** membranous basally, sometimes becoming coriaceous at maturity, glabrous or with hairs, (4)5- to 15-veined, usually unawned, sometimes awned, awns to 12 mm long, straight; **paleas** from  $\frac{1}{2}$  as long as to almost equaling the lemmas, keels usually ciliate; **lodicules** fused into a single, collarlike structure extending  $\frac{1}{2}$ – $\frac{2}{3}$  around the base of the ovaries; **anthers** (2)3. **Caryopsis** smooth, glabrous, longitudinally furrowed, falling from the floret when mature.  $x = 9$ .

*Melica* includes 92 species, which grow in temperate regions of the world but is absent from Australia (Soreng et al., 2017b).

### KEY TO SPECIES OF *MELICA*

- 1. Spikelets 6–8 mm long, with 1 bisexual and 1 rudimentary florets ..... *M. montezumae*
- 1. Spikelets 8–16 mm long, with 4 bisexual and 1 rudimentary florets ..... *M. porteri*

198. *Melica montezumae* Piper, Proc. Biol. Soc. Wash. 18: 144. 1905.

FIGURE 145

**Plants** caespitose, not rhizomatous. **Culms** 14–100 cm tall, not forming corms; **internodes** smooth. **Sheaths** glabrous or scabrous; **ligules** 2.5–7 mm long; **blades** 1.2–3 mm wide, abaxial surfaces glabrous, scaberulous, adaxial surfaces puberulent. **Panicles** 5–25 cm long; **branches** 1–5 cm long, appressed to reflexed, straight, with 2–9 spikelets; **pedicels** sharply bent below the spikelets; **disarticulation** below the glumes. **Spikelets** 6–8 mm long, with 1 bisexual floret; lower glumes 5.5–8 mm long, 1.8–3 mm wide, 5-veined; **upper glumes** 5–8 mm long, 0.7–1.5 mm wide, 3- to 5-veined; **lemmas** 4.5–8 mm long, 9- to 15-veined, veins prominent, tuberculate, proximal portion with flat, twisted hairs, distal portion glabrous, chartaceous, apex emarginate to acute, unawned; **paleas** about  $\frac{3}{4}$  the length of the lemmas; **anthers** 1.5–3 mm long; **rudiments** 2–3 mm long, ob-ovoid or obconic, clublike, not resembling the bisexual florets.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Melica montezumae* grows primarily in shady locations in the mountains of west Texas and adjacent Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Chihuahua, 1885, *E. Wilkinson* 342 (US). **Jiménez:** Santa Eulalia Mts, 6 Apr 1885, *C.G. Pringle* 430 (US).

199. *Melica porteri* Scribn., Proc. Acad. Nat. Sci. Philadelphia 37: 44, t. 1, f. 17–18. 1885.

FIGURE 146

**Plants** not or loosely caespitose, short rhizomatous. **Culms** 55–100 cm tall, not forming corms; **internodes** smooth, basal internodes not thickened. **Sheaths** often scabrous on the keels, otherwise smooth; **ligules** 1–7 mm long; **blades** 2–5 mm wide, both surfaces glabrous, scaberulous. **Panicles** 13–25 cm; **branches** 1–9 cm long, straight and appressed or flexible and ascending to strongly divergent, with 1–12 spikelets; **pedicels** sharply bent below the spikelets; **disarticulation** below the glumes. **Spikelets** 8–16 mm long, 1.5–5 mm wide, parallel-sided when mature, with 2–5 bisexual florets; **rachilla internodes** 1.9–2.1 mm long; **glumes** green, pale, or purplish-tinged; **lower glumes** 3.5–6 mm long, 2–3 mm wide, 5-veined; **upper glumes** 5–8 mm long, 2–3 mm wide, 5-veined; **lemmas** 6–10 mm long, glabrous, chartaceous on the distal  $\frac{1}{3}$ , 5- to 11-veined, veins conspicuous, apex rounded to acute, unawned; **paleas** about  $\frac{2}{3}$  the length of

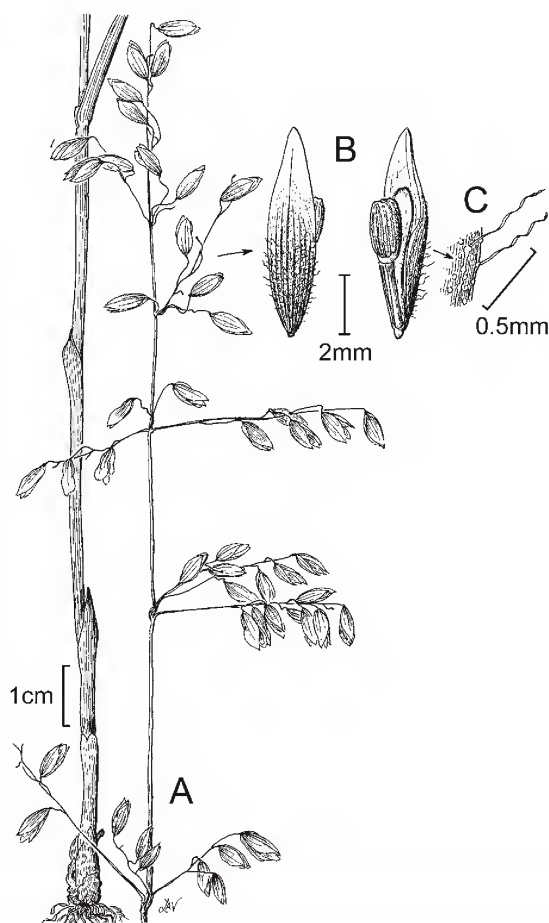


FIGURE 145. *Melica montezumae*. A. Habit. B. Florets. C. Flat, twisted hairs. Drawn by Linda Ann Vorobik; copyright Utah State University.

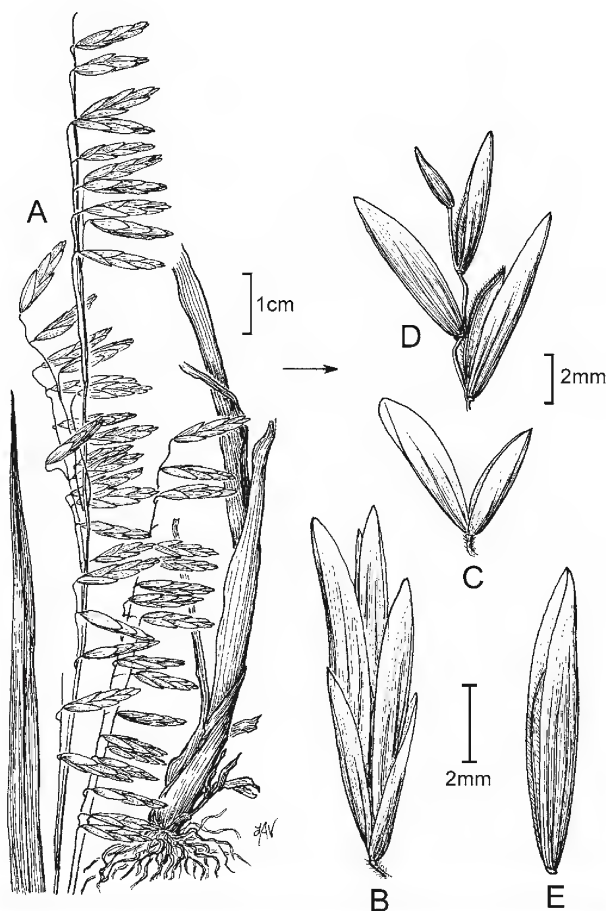


FIGURE 146. *Melica porteri*. A. Habit. B. Spikelet. C. Glumes. D. Spikelets. E. Floret. Drawn by Linda Ann Vorobik; copyright Utah State University.

the lemmas; **anthers** 1–2.5 mm long; **rudiments** 1.8–5 mm long, acute to acuminate, resembling the bisexual florets.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Melica porteri* grows on rocky slopes and in open woods, often near streams. It grows from Colorado and Arizona to central Texas and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Chihuahua, 9 Oct 1888, C.G. Pringle 2045 (US).

### ***Melinis* P. Beauv.**

Annual or perennial; habit various. Culms erect, decumbent, or prostrate. Sheaths open; ligules of hairs or membranous and ciliate. Inflorescences terminal, simple panicles or panicles of spike-like primary branches, usually with capillary secondary

branches and pedicels; disarticulation below the glumes, sometimes also below the upper florets, the upper florets then falling first. Spikelets with 2 florets; lower glumes present or absent, 0- to 1-veined, unawned; upper glumes equaling or exceeding the florets, sometimes gibbous basally, 5- to 7-veined, emarginate to bilobed, awned or unawned; lower florets staminate or sterile; lower lemmas similar to the upper glumes, but not gibbous; upper florets bisexual, laterally compressed; upper lemmas subcoriaceous, glabrous, smooth, unawned; upper paleas resembling the upper lemmas; lodicules 2, fleshy or membranous.  $x = 9$ .

*Melinis* is an African and western Asian genus of 22 species that grow in savannahs, open grasslands, and disturbed places.

200. *Melinis repens*\* (Willd.) Zizka, Biblioth. Bot. 138: 55. 1988.  
*Saccharum repens* Willd., Sp. Pl. 1: 322. 1797. *Rhynchely-*

*trum repens* (Willd.) C. E. Hubb., Bull. Misc. Inform. Kew 1934(3): 110.1934.

FIGURE 147

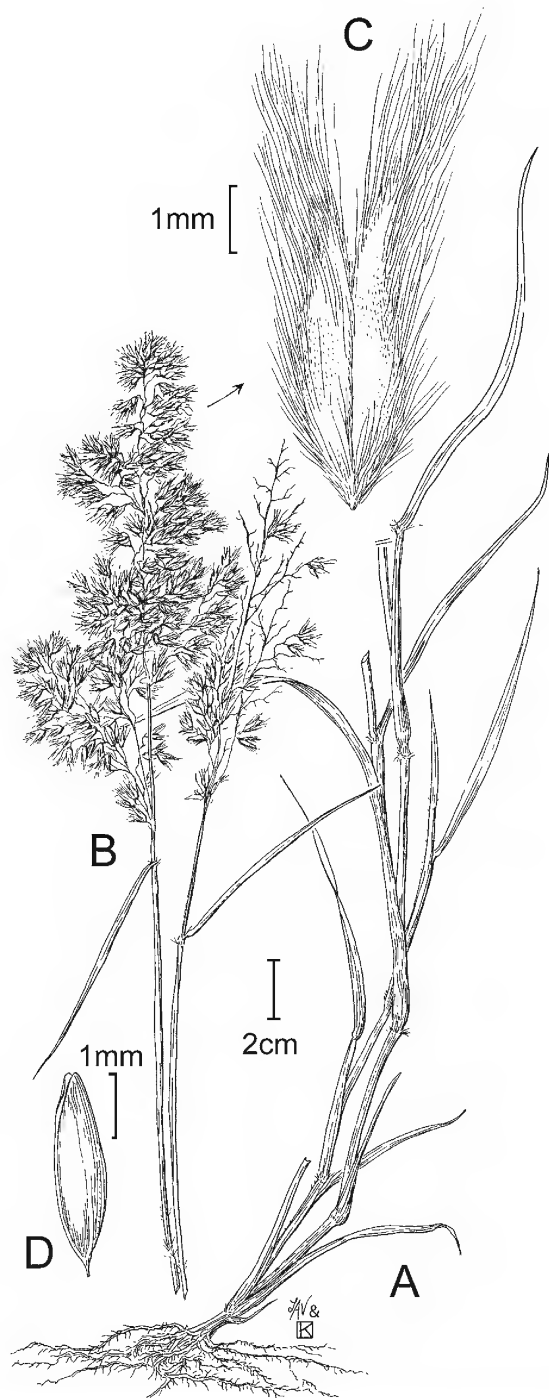


FIGURE 147. *Melinis repens*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Upper floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

Annual or short-lived perennial. Culms (20)40–150 cm long, decumbent, usually rooting at the lower nodes; nodes pubescent; internodes glabrous or with papillose-based hairs, hairs to 4.7 mm long. Sheaths glabrous or with papillose-based hairs, hairs 0.5–4.7 mm; ligules 0.7–2.2 mm long, of hairs; blades 3.6–27 cm long, 2–9(14) mm wide, flat, glabrous or pubescent, with or without papillose-based hairs. Panicles (4)6–22 cm long, (1.5)2.5–12 cm wide; primary branches to 11 cm long, ends of the primary branches, secondary branches, and pedicels capillary; pedicels 0.6–5.3 mm long, usually hairy distally, hairs to 6.3 mm. Spikelets 2–5.7 mm; callus hairs to 4 mm long; lower glumes 0–1.7 mm long, pubescent, sometimes with papillose-based hairs, apex rounded, truncate, or slightly cleft; upper glumes (1.9)2.3–4.9 mm long, enclosing the upper florets, gibbous basally, densely pubescent, the hairs to 7 mm long, sometimes papillose-based, varying from white to rose or darkish purple, apex tapering, beaked, glabrous, unawned or awned, awns to 4.1 mm; lower florets staminate or sterile; lower lemmas 1.9–4.8 mm long, unawned or with awns to 4.2 mm; lower paleas 0.9–4 mm long; anthers (0.8)1.5–2.6 mm long, orange-brown to orange; upper lemmas 1.8–2.7 mm long, glabrous; anthers 3, 1.2–1.7 mm long, orange-brown to orange. Caryopsis 1.3–1.9 mm long, 0.6–0.9 mm wide.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Melinis repens* is native to Africa and western Asia. It is now established throughout the subtropics, including the southern portion of North America and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: terracería [dirt road] Batopilas–La Bufa, 1.4 km del entronque [junction] Mesa de la Yerbabuena, 14 Feb 2003, R. Bye & col. 31361 (US); Parque Nacional Barranca del Cobre, 3.2 km S of La Bufa on road to Batopilas, tropical forest, 1050 m, P.M. Peterson, Annable & Valdés-Reyna 10859 (US). Madera: Mesa del Yerbanis, ejido El Largo, 12 Oct 1990, bosque [forest] de *Quercus*, 1900 m, O. Bravo 1854 (CIIDIR, MEXU); Ciénega Ojo de la Vibora, ejido El Largo, 14 Aug 1990, bosque de encino [oak], 1800 m, A. Benítez 1919 (CIIDIR, MEXU). Matamoros: 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, P.M. Peterson & Annable 5979 (ENCB, US). Ocampo: Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 13 km from the Cahuisori–Ocampo road on the road to Candamena, 2.25 km below Cruz, 23 Sep 1994, 1570 m, Spellenberg, Corral & Estrada 12145 (NMC). Temosachi: Nabogame, 5 Aug 1988, 1800 m, Laferr. 1623 (NMC).

### *Microchloa* R. Br.

Perennial (rarely annual); erect and caespitose, or decumbent and mat-forming. Culms 5–60 cm; nodes glabrous. Leaves mostly basal; ligules membranous and ciliate or of hairs; blades

often stiff, convolute. Inflorescences terminal, panicles with a solitary (rarely 2), slender, spikelike branch; rachises curved or falcate, semicircular or crescentic in cross section. Spikelets solitary, with 1(2) floret, terete to dorsally compressed; florets bisexual; disarticulation above the glumes; glumes subequal, exceeding the florets, 1-veined; lower glumes asymmetric, keeled, keels somewhat twisted; upper glumes symmetric, flat, midveins straight; lemmas membranous or hyaline, 3-veined, veins hairy; paleas with 2 pubescent keels. Caryopsis 0.9–1.5 mm long, glabrous.  $x = 10, 12$ .

*Microchloa* includes six species that occur throughout the tropics (Cope 1999; Peterson et al., 2015). Most species grow in open mesic to xeric habitats, often in shallow, hard soils.

201. *Microchloa kunthii* Desv., Mém. Soc. Agric. Angers 1: 179. 1831.

Perennial; forming small, dense tufts. Culms 5–30 cm long. Sheaths generally shorter than the internodes; ligules 1–1.5 mm long, ciliate; blades 1–1.5 mm wide, flat or folded, with thick, scabrous, white margins; cauline blades 1–2.5 cm long; innovation blades to 6 cm. Panicle branches 6–15 cm long; rachises ciliate. Spikelets 2.5–3.5 mm long; lemmas 2–2.5 mm long, keels pilose, margins densely pilose, hairs 0.2–1 mm long.  $2n = 24, 40$ .

**DISTRIBUTION AND HABITAT.** *Microchloa kunthii* grows on granitic outcrops on rocky slopes. Its range extends southward from the mountains in Arizona and the Big Bend region of Texas through Mexico to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** Ejido de Guazarachic, 9 Aug 1974, pinyon woodlands, 2250 m, *M.F. Robert 3216* (ENCB); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, pine-oak forest, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna 10703* (CIIDIR, US). **Batopilas:** Arroyo Baqueachi, at 1/2 km E of small village [village], 28 Aug 2003, grassland, 2004 m, *P.M. Peterson & P. Catalán 17571* (US). **Bocoyna:** 18.7 mi S of San Juanito on road to Creel, 2200 m, *P.M. Peterson & Annable 5862b* (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela 22152* (US). **Chihuahua:** Dry gravelly soil, hills and plains near Chihuahua, 6 Aug 1885, *C.G. Pringle 425* (ENCB, US); 40 km W of Chihuahua, 20 Aug 1939, 1735 m, *L. H. Harvey 1550* (US); km 28 Cd. Chihuahua–Cd. Cuauhtémoc, 27 Oct 1954, *Hern.-Xol. & C. Tapia N-281* (US); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, *J.K. Meents & W.H. Moir 100* (NMC); La Campana, Potrero El Plan, 4 km sureste [SE] carr. [hwy] Panamericana, 11 Sep 73, pastizal [pastureland], 1500 m, *Valdés-Reyna VR-206* (RELC); Gravelly plains near Chihuahua, 6 Sep 1888, *C.G. Pringle 1100* (MEXU). **Cuauhtémoc:** 16 mi W of Cuauhtémoc, 31 Aug 1958, *Reeder & C. Reeder 3133* (US). **Cusihiuriáchi:** 4 km al sur de Estación Cusihiuriáchi, 10 Aug 1975, bosque de pino-encino [pine-oak forest], 2140 m, *J.M. Peña JMP-125* (RELC). **Guachochi:** NW of Norogachic, ca. 3 road miles; airport near locality called

to Achiachic, 23 Aug 1978, pine forest, 2500 m, *Bye 8808* (MEXU). **Guerrero:** 35.4 km SW of La Junta and approx. 74 km N of Creel, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable 5839* (ENCB, US); 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, *P.M. Peterson, Annable & Y. Herrera 7988* (ENCB, US); carr. la Junta–San Juanito, 17 km, 22 Sep 1997, 2290 m, *B. Tab V. 2* (MEXU). **Manuel benavides:** E Chihuahua, vicinity of Pirámide, 12 Aug 1941, *I.M. Johnston 8120* (MEXU, US). **Matamoros:** 5 km al S de Villa Matamoros, carr. Parral–Durango, 14 Sep 1991, pastizal, 2000 m, *J.L. Reyes s/n* (MEXU); 18.2 km SE of Villa Matamoros on Mex 45 to Durango, 1780 m, oaks, 22 Sep 1991, *P.M. Peterson, Annable & Valdés-Reyna 10866* (US). **Riva Palacio:** Majalca (Pilares), 11 Aug 1939, *L. H. Harvey 1452* (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7954* (ENCB, US). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, *P.M. Peterson & Annable 5962* (ENCB, US).

### *Muhlenbergia* Schreb.

Annual or perennial; hermaphrodites or occasionally monoecious; often caespitose, sometimes mat-forming, usually rhizomatous, rarely stoloniferous. Culms 2–300 cm tall, erect, geniculate, or decumbent, usually herbaceous, sometimes becoming woody; internodes solid or hollow. Sheaths open, auricles absent; ligules membranous or hyaline, sometimes firm or coriaceous, acuminate to truncate, sometimes minutely ciliate, sometimes with lateral lobes longer than the central portion; blades narrow, flat, folded, or involute, sometimes arcuate. Inflorescences terminal, sometimes also axillary, open to contracted or spikelike panicles; disarticulation usually above the glumes, occasionally below the pedicels. Spikelets 1(2–3)-flowered, laterally compressed or terete; glumes subequal in length, mostly shorter than the lemmas, or as long as or exceeding the lemmas, usually (0)1(2 or 3)-veined, apex entire, erose, or toothed, truncate to acuminate, sometimes mucronate or awned; lower glumes sometimes rudimentary or absent, occasionally bifid; upper glumes shorter than to longer than the florets; lemmas membranous or rather firm, glabrous, scabrous, or with short hairs, 3-veined (occasionally appearing 5-veined), callus glabrous or hairy, apex awned, mucronate, or awnless; awns, if present, straight, flexuous, sinuous, or curled, sometimes borne between 2 minute teeth; paleas membranous or rather firm, well-developed, about as long as or shorter than the lemma, 2-veined, rounded on the back; lodicules 2, short, fleshy, truncate; lateral margins thin; ovary glabrous, styles free to their bases, stigmas 2; stamens (1 or 2)3, anthers purple, orange, yellow, or olivaceous. Caryopsis elongate, fusiform or ellipsoid, slightly dorsally compressed, usually not falling free from the lemma and palea. Cleistogamous panicles sometimes present in the axils of the lower cauline leaves, enclosed by a tightly rolled, somewhat indurate sheath. Chromosome number  $x = 8, 9, 10$ .



*Muhlenbergia* contains approximately 182 species, most of them native to the Americas; 6 species occur in southeastern Asia (Peterson and Annable 1990, 1991, 1992; Herrera Arriata

1998; Peterson 2003b; Herrera Arriata and Peterson 2007; Wu and Peterson, 2006; Peterson et al., 2007, 2010; Soreng et al., 2017b).

#### KEY TO SPECIES OF MUHLENBERGIA

1. Spikelets in clusters of 3 to 5 or more; lemmas usually with veins (lateral or central) excurrent into awns.
  2. Spikelets subtended by bristles on 1 side, clustered; leaves with prominent auricles ..... *M. pereilema*
  2. Spikelets in varied inflorescences, never subtended by bristles on 1 side; leaves without auricles.
    3. Central spikelet sessile to short-pedicellate, pedicels up to 0.5 mm long; glumes lobes acute or awned, the awn terminal, 2–4 mm long ..... *M. cenchroides*
    3. Spikelets all pedicellate, pedicels 0.5–3 mm long; glumes lobes obtuse or rounded, wide and papiraceous; unawned or with a mucro 0.5–1 mm long.
      4. Fertile floret mucronate or with an awn less than 1.5 mm long ..... *M. imperfecta*
      4. Fertile lemma awned, the awn 3–8(11) mm long ..... *M. uniseta*
1. Spikelets not in clusters of 3, if in clusters then in pairs; lemmas with veins not excurrent into awns.
  5. Inflorescence 1-sided raceme-like panicles; branches 1 per node; spikelets in pairs, at the end of branches ..... *M. tarahumara*
  5. Inflorescence several-sided panicles or raceme-like, never 1-sided; branches 1 or more per node; spikelets never in pairs.
    6. Lemma veins densely silky-pubescent.
      7. Annual plants, erect to geniculate; lemma 1.3–1.7(1.9) mm long; pedicels of terminal spikelet on each branch nodding to reflexed ..... *M. shepherdii*
      7. Perennial plants, densely tufted, erect; lemma 2.3–3.2(3.8) mm long; pedicels of the terminal spikelet on each branch straight, flexuous to occasionally nodding to reflexed ..... *M. tricholepis*
    6. Lemma veins not densely silky-pubescent.
      8. Spikelets usually 2-flowered, the perfect floret sessile and the pedicellate floret staminate to neutral, plumbeous.
        9. Annual plants; ligules 1.6–3.2 mm long; palea veins usually extended into awns ..... *M. decumbens*
        9. Perennial plants; ligules 6–10 mm long; palea veins not extended into awns ..... *M. ligulata*
      8. Spikelets 1-flowered, with variable colors and textures.
        10. Annual plants.
          11. Glumes and lemmas awnless, the lemma sometimes mucronate.
            12. Lemmas 2.6–3.2 mm long, with prominent veins, somewhat dorsally compressed, oblong-ellipsoid; culms 30–80 cm tall, stout ..... *M. schmitzii*
            12. Lemmas up to 2.5 mm long, with inconspicuous veins, rounded, narrowly lanceolate to elliptic-oblong; culms up to 40 cm tall, slender.
              13. Glumes longer than the lemma, acuminate.
                14. Lemma appressed-pubescent at margins and midvein, 1.4–1.7 mm long, apex acute; pedicels erect; palea appressed-pubescent on the proximal  $\frac{3}{4}$ , 1.4–1.7 mm long; glumes 1.6–2.1 mm long; auricles absent ..... *M. annua*
                14. Lemma glabrous, 1–1.2 mm long, apex rounded or obtuse; pedicels nodding or reflexed, at least in the terminal spikelet of each branch; palea glabrous, 1–1.2 mm long; glumes 1.2–1.5 mm long; auricles present ..... *M. majalcensis*
              13. Glumes shorter than the lemma, obtuse to acuminate.
                15. Glumes pubescent at least at the apex, short-pilose to villous.
                  16. Pedicels nodding or reflexed, at least in the terminal spikelet of each branch; anthers olivaceous, 0.6–1.2 mm long ..... *M. sinuosa*
                  16. Pedicels ascending, at least in the terminal spikelet of each branch; anthers purple, up to 0.7 mm long.
                    17. Lemma 0.8–1.5 mm long, obtuse to subacute, awnless ..... *M. minutissima*
                    17. Lemma 1.3–2 mm long, acuminate, mucronate to short-awned, the mucro or awn 0.1–1(2) mm long ..... *M. texana*
                15. Glumes glabrous or minutely scabrous close to the apex.
                  18. Panicle branches capillary, spreading, open to reflexed; inflorescence 3.5–11 cm wide; blade margins and midveins prominent, whitish and thickened.

19. Pedicels nodding or reflexed, at least in the terminal spikelet of each branch; lemma 1.3–1.8 mm long, glabrous; anthers 0.6–1.3 mm long . . . . . *M. capillipes*
19. Pedicels all erect; lemma 1–1.2 mm long, densely short-pubescent on the margins and midnerve or glabrous; anthers 0.3–0.5 mm long . . . . . *M. fragilis*
18. Panicle branches not capillary, closely appressed or widely spreading; inflorescence 0.6–3.4 cm wide; blade margins and midveins never prominent, whitish and thickened.
20. Panicle contracted, narrow, often partially included in the uppermost sheath, 0.2–0.7 cm wide; branches ascending or appressed; culms geniculate or decumbent, often rooting at the lower nodes.
21. Panicle long-exserted; branches 9–12 mm long, closely appressed at maturity; blades mostly basal, numerous . . . . . *M. filiformis*
21. Panicle partially included in the superior sheath; branches 3–10 mm long, ascending or appressed; blades mostly cauline . . . . . *M. vaginata*
20. Panicle loosely contracted, exserted, 0.6–2.5 cm wide; branches usually open, extended or reflexed to closely appressed; culms erect or spreading, not rooting at the lower nodes . . . . . *M. ramulosa*
11. Glumes or lemmas, or both, awned, the awns 1.3–40 mm long.
  22. Lemmas deeply bilobed, the lobe apex rounded to obtuse, the lobes 1–1.4 mm long, lateral veins prominent on the lower ½, scarce to densely appressed villous pubescence, the brownish hairs 0.5–0.7 mm long . . . . . *M. biloba*
  22. Lemmas not deeply bilobed, sometimes minutely bifid, then the teeth usually acuminate to aristate, the teeth less than 1 mm long, lateral veins evident along entire length, pubescence, when present, not as above.
  23. Lemma 1.3–2.5 mm long.
    24. Upper glumes apex wide and truncate, usually 2- to 3-toothed.
    25. Lemma awn sinuous-undulate, crisped and flexuous, olive-green; lemma inflated near the central part, lanceolate, 1.7–2.2 mm long . . . . . *M. crispiseta*
    25. Lemma awn irregularly flexuous, purplish; lemma narrowly lanceolate, 1.4–4.2 mm long . . . . . *M. peruviana*
  24. Upper glumes apex acute, acuminate or subulate, often awned.
  26. Glumes pubescent near the apex, short-pilose to villous; lemma awn up to 3.5 mm long.
    27. Lemma 1.3–2 mm long, lemma awn 0.1–1(2) mm long; caryopsis 0.8–1 mm long; pedicels 2–7 mm long, usually longer than florets; palea 1.3–2 mm long, minutely appressed-pubescent at proximal half . . . . . *M. texana*
    27. Lemma (1.7)1.9–2.5 mm long, lemma awn 1.2–3.5 mm long; caryopsis 1.3–2.3 mm long; pedicels 1–2(3) mm long, usually shorter than florets; palea glabrous, 1.8–2.4 mm long . . . . . *M. eludens*
  26. Glumes glabrous or minutely scabrous; lemma awn up to 32 mm long.
    28. Lemma awn 1–3 mm long, lemma somewhat dorsally compressed, oblong ellipsoid, shortly and densely pubescent over the veins, yellowish . . . . . *M. flavida*
    28. Lemma awn more than 3 mm long; lemma not dorsally compressed, lanceolate or subulate, generally glabrous or if pubescent, the hairs elongate toward the apex, usually green or purple.
    29. Ligules 1.2–3(5) mm long; lower glumes 1.2–2 mm long, upper glumes 1.5–2.8 mm long; panicles 7–20 cm long . . . . . *M. tenuifolia*
    29. Ligules 0.3–0.5 mm long; lower glumes 0.7–1.5 mm long, upper glumes 1–1.8 mm long; panicles 4–12 cm long . . . . . *M. ciliata*
23. Lemma greater than 2.5 mm long.
  30. Upper glumes apex wide and truncate, usually 2- to 3-toothed; lemma awn flexuous, purple . . . . . *M. peruviana*
  30. Upper glumes apex obtuse, acute or acuminate, often awned; lemma awn straight to flexuous, brown-greenish to purple.
  31. Panicle contracted, narrow, the branches ascending and close-appressed, up to 2 cm wide at maturity.

- 32. Lemma awn 1–3 mm long, lemma somewhat dorsally compressed, oblong-ellipsoid, with prominent veins . . . . . *M. strictior*
  - 32. Lemma awn 7–20 mm long; lemma subulate to lanceolate, veins never prominent.
  - 33. Glumes elliptical, oblong or lanceolate, up to 2 mm long, excluding the awn; lower glumes 1-veined, apex bifid; spikelets borne singly.
  - 34. Ligules 0.3–0.9 mm long, lemma 3–4.5(5) mm long, subulate to lanceolate, not rounded, glabrous to antrorsely scabrous, appearing 5-veined; cleistogamous spikelets usually absent in the axils of proximal branches . . . . . *M. pectinata*
  - 34. Ligules 1–3 mm long; lemma 2.5–3.5(4) mm long, narrowly lanceolate, rounded, scabrous, 3-veined; cleistogamous spikelets usually present in the axils of proximal branches . . . . . *M. microsperma*
  - 33. Glumes of superior spikelets of each branch subulate, 2–5 mm long; lower glumes 2-veined, with 2 small awned teeth, awns 0.8–1.3 mm long; spikelets generally borne in pairs, 1 sessile and 1 pedicellate.
  - 35. Glumes equal or longer than the lemma; lemmas 2.5–4.5 mm long, awn 7–15 mm long in the distal spikelet of each branch . . . . . *M. depauperata*
  - 35. Glumes ½ or less as long as the lemmas; lemmas 4–5(6) mm long, the awn 10–20 mm long in the distal spikelet of each branch . . . . . *M. brevis*
  - 31. Panicle open with spreading branches, more than 2 cm wide at maturity.
  - 36. Lemma awn 1–3 mm long; lemma somewhat dorsally compressed, oblong-ellipsoid with prominent veins.
  - 37. Lemma 2.2–3 mm long; panicle branches broadly ascending, sparsely flowered, naked toward base . . . . . *M. flavida*
  - 37. Lemma 3–4.2 mm long; panicle branches narrowly ascending, appressed, flowered from the base . . . . . *M. strictior*
  - 36. Lemma awn 5–30 mm long, lemma generally rounded.
  - 38. Glumes obtuse to acute, 0.2–0.7 mm long.
  - 39. Glumes dimorphic, those from proximal spikelets of each branch often awnless, those of distal spikelets often 1 or both awned; ligules up to 0.8 mm long; inflorescence appearing secund or placed on 1 side of main axes . . . . . *M. diversiglumis*
  - 39. Glumes similar in all spikelets, awnless; ligules 1–2.5(3) mm long; inflorescence not secund.
  - 40. Inflorescence diffuse at maturity; pedicels capillary, thin and flexuous, glabrous; cleistogamous spikelets absent; lemmas scabrous on and among veins . . . . . *M. implicata*
  - 40. Inflorescence not diffuse; pedicels short and thick, antrorsely scabrous; cleistogamous spikelets usually present at the axils of inferior branches; lemmas scabrous, with short hairs, appressed on veins close to the base . . . . . *M. microsperma*
  - 38. Glumes mostly acute or awned, 0.8–2(3) mm long.
  - 41. Glumes dimorphic, those from proximal spikelets of each branch often awnless, 0.2–0.7 mm long, those from distal spikelets often 1 or both awned; inflorescence appearing secund or inserted on 1 side of the main axes . . . . . *M. diversiglumis*
  - 41. Glumes similar in all spikelets; inflorescence not secund.
  - 42. Ligules 1.2–3(5) mm long; anthers 0.9–1.6 mm long; lemma scabrous and rugose, 2–3.5(4) mm long, veins inconspicuous . . . . . *M. tenuifolia*
  - 42. Ligules 0.3–0.9 mm long; anthers 0.3–0.6 mm long; lemma delicate and not scabrous-rugose, 3–4.5(5) mm long, with conspicuous, greenish veins . . . . . *M. pectinata*
10. Perennial plants.
- 43. Plants rhizomatous, rhizomes often stout, scaly, and creeping.

44. Blades articulated at base and early deciduous, culms much branched and lignified, bamboo-like, covered by cylindrical sheaths, the apex truncate; culms 100–300 cm tall; rhizomes 2–5 mm thick ..... *M. dumosa*
44. Blades not articulated, persistent, occasionally constricted at the base but without a lineal abscission, if belatedly deciduous, then the sheaths apex breaking irregularly; culms usually less than 100 cm tall, if occasionally bamboo-like, then the culms at base (or stolons) 1–2 mm thick and rooting at the nodes.
45. Lemmas awned, the awns (1)3–20(25) mm long; rhizomes short, inconspicuous.
46. Lemma awns 0.1–3(5) mm long, straight; panicle 1–3 mm wide; sheaths longer than the internodes ..... *M. glauca*
46. Lemma awns 10–20(25) mm long, flexuous; panicle (6)10–20 mm wide; sheaths mostly shorter than internodes ..... *M. polycaulis*
45. Lemmas unawned or mucronate, the mucros 0.1–0.8 mm long; rhizomes elongate and conspicuous.
47. Panicles narrow to open, 4–16 cm wide.
48. Ligules 1–3 mm long.
49. Culms nodulose-rugose; lemma 2–3 mm long, almost cylindrical ..... *M. richardsonis*
49. Culms smooth, lemma 2–2.5 mm long, never cylindrical ..... *M. vaginata*
48. Ligules 0.5–1(2) mm long.
50. Ligules 0.5–2 mm long, hyaline, with well-developed lateral lobes or auricles; blade margins and midveins prominent, whitish, thickened ..... *M. arenacea*
50. Ligules 0.2–1 mm long, ciliate, without lateral lobes or auricles; blade margins and midveins not conspicuously thickened, greenish ..... *M. asperifolia*
47. Panicles contracted, narrow, 0.1–3.9 cm wide.
51. Spikelets 1.4–2.5 mm long.
52. Lemmas and paleas densely villous, the hairs 0.4–1 mm long; sheaths 5–15 cm long; panicles usually on an exserted peduncle; ligules apex acute ..... *M. villiflora*
52. Lemmas and paleas glabrous or with minute appressed pubescence, the hairs about 0.1 mm long; sheaths 0.3–2.4 cm long; panicles partially included in the upper sheaths; ligules apex obtuse or truncate.
53. Panicle 1–5 cm long, 0.1–0.4 cm wide; lemma awnless, minutely pubescent along margins and at base, the lemma green or purplish ..... *M. utilis*
53. Panicle 0.5–3 cm long, 0.3–0.7 cm wide; lemma mucronate, the mucro about 0.2 mm long, sparsely short-pubescent over the proximal ½, with conspicuous dark olivaceous spots ..... *M. vaginata*
51. Spikelets 2.4–8 mm long.
54. Lemmas with tawny hairs up to 0.6 mm long on the lower ½ along the midveins and margins; leaf blades 4–12 cm long, not arcuate; anthers 1.8–2.4 mm long, orange ..... *M. glauca*
54. Lemmas glabrous or with minute appressed pubescence along margins and the base, the hairs less than 0.1 mm long; leaf blades 0.4–6 cm long, somewhat arcuate spreading; anthers 0.7–1.4 mm long, yellow to purplish ..... *M. repens*
43. Plants caespitose, rhizomes absent.
55. Upper glumes 3-veined; old sheaths flattened below and sometimes spirally twisted near base.
56. Upper glumes apex 3-toothed and 3-awned, the teeth usually awned (including the awns) ⅓ to ½ the length of the glumes, and the awns up to 1.7 mm long ..... *M. montana*
56. Upper glumes apex entire or 2- to 4-toothed, the teeth small and unawned, less than ⅓ the length of the glumes.
57. Panicles 2–5 cm long; ligules 0.2–0.5 mm long, apex truncate; culms 20–30 cm tall ..... *M. flaviseta*
57. Panicles 5–25 cm long; ligules 2–20 mm long, apex acuminate; culms 10–80(100) cm tall.
58. Sheath becoming flat, ribbonlike or papery and conspicuously spirally twisted near base; upper glumes apex entire and acute; spikelets light grayish-green to white; ligules (6)10–20 mm long, hyaline, not brownish below ..... *M. virescens*

58. Sheaths flat below but usually not spirally twisted near base; upper glumes apex often with 3 or 4 small teeth and truncate; spikelets plumbeous; ligules 2–8 mm long, membranous to hyaline and often brownish below ..... *M. quadridentata*
55. Upper glumes usually 1-veined (rarely 2- or 3-veined); old sheaths usually not flat or spirally twisted near base.
59. Culms (65)80–230(300) cm tall; leaf blades 20–100 cm long, 2–7 mm wide, flat or folded.
60. Lemmas unawned, mucronate (mucros less than 1 mm long), or awned, with awns 1–4 mm long.
61. Panicle 35–100 cm long, (8)15–30 cm wide, purple or brown; branches 6–25 cm long, naked at base; spikelets 1.3–2.6 mm long ..... *M. gigantea*
61. Panicle 15–55 cm long, 0.6–15 cm wide, green with some purple spots; branches 0.5–13 cm long, flowered almost from base; spikelets 2–4.6 mm long.
62. Ligules 10–35 mm long, stiff, decurrent, brown basally; lemmas glabrous to sparsely puberulent at base.
63. Lemmas awnless or the awn up to 4 mm long; basal sheaths strongly compressed-keeled ..... *M. lindheimeri*
63. Lemmas awnless or the awn up to 2 mm long; basal sheaths rounded to gently compressed-keeled ..... *M. longiligula*
62. Ligules 2–15 mm long, lemma pilose over the proximal half or entire surface.
64. Plants sparsely to densely pilose on culms, leaves, and spikelets; lemma (2)2.4–2.6(3) mm long ..... *M. pubescens*
64. Plants glabrous to scabrous on culms, leaves, and spikelets; lemma 2.2–3.5 mm long.
65. Leaf sheath auricles absent; ligules 10–25 mm long; lemmas pubescent along the midvein and margins on lower  $\frac{1}{2}$ – $\frac{3}{4}$  ..... *M. emersleyi*
65. Leaf sheath auricles present, (1)2–4(10) mm long, linear subulate to broadly triangular, longer above, straight or twisted, firm below; ligules 2–10(12) mm long; lemmas glabrous or pubescent with scattered hairs on the lower  $\frac{1}{2}$  ..... *M. robusta*
60. Lemmas awned, with awns 5–30(40) mm long.
66. Sheath auricles present, long and pointed, 10–20 mm long, lemma awn 10–15 mm long ..... *M. distichophylla*
66. Sheath auricles absent or rudimentary, rarely more than 2 mm long.
67. Spikelets 1.2–2.2 mm long, generally reddish to purple; glumes as long as or shorter than lemma.
68. Branches and leaves woolly pubescent; glumes the same length as the lemma, apex obtuse, awnless ..... *M. speciosa*
68. Branches and leaves glabrous to scaberulous; glumes shorter than the lemma, unequal, apex acuminate, awned, awn up to 1 mm long ..... *M. scoparia*
67. Spikelets 2.2–3.2 mm long, green-grayish; glumes longer than lemma ..... *M. emersleyi*
59. Culms 10–70 cm tall; leaf blades 1–16 cm long, 0.3–2.5 mm wide, filiform, involute, flat or folded.
69. Panicles broad, open, loosely contracted to diffuse, (2)3–20 cm wide; panicle branches usually widely spreading to loosely ascending.
70. Lemmas unawned; spikelet pedicels flexuous nodding or reflexed; lemmas with a thick covering of tawny to shiny silky hairs located on the midvein and margins; paleas densely villous between the veins ..... *M. tricholepis*
70. Lemmas with awns 0.5–40 mm long; spikelet pedicels erect, not flexuous nodding or reflexed; lemmas without a thick covering of tawny to shiny silky hairs on the midvein and margins but with appressed pubescence, the hairs scattered; paleas sparsely pubescent between the veins.
71. Plants decumbent or geniculate, generally short, culms 15–60(80) cm tall, leaf blades 2–10 cm long (occasionally up to 16 cm long in *M. arenicola* and *M. argentea*).
72. Plants conspicuously branched, especially from the middle and lower nodes, loosely caespitose; culms decumbent, geniculate, or erect.



73. Plants distinctly bushy in appearance; perennial with a wiry and knotty base; panicles 6–15 cm wide; anthers 1.5–2.3 mm long; caryopsis ellipsoid, compressed, yellowish brown . . . . . *M. porteri*
73. Plants not distinctly bushy in appearance; plants short-lived perennials to annuals with delicate bases; panicles 1–6.5 cm wide; anthers 0.9–1.5 mm long; caryopsis narrowly fusiform, terete, brownish . . . . . *M. tenuifolia*
72. Plants not conspicuously branched, caespitose; culms erect to rarely slightly decumbent near the base.
74. Spikelets silvery-olive to reddish; panicles 0.7–3.5 cm wide; lemma awns 5–10 mm long; anthers 1–1.6 mm long, green-yellowish . . . . . *M. argentea*
74. Spikelets never silvery-olive to reddish, mostly green; panicles 3–20 cm wide; lemma mucronate or awned 0.5–4 mm long; anthers 1.2–2.1 mm long, greenish or purplish.
75. Plant base not rhizomatous; leaf blades 4–7 cm long, with margins and midvein whitish, hardened, cartilaginous . . . . . *M. arizonica*
75. Plant base rhizomatous, the rhizomes short, leaf blades 5–10(16) cm long, margins and midvein not prominent, not cartilaginous, green.
76. Leaf blades not arcuate, 1–2.2 mm wide, 4–10(16) cm long; 1 or more culm nodes exposed; leaf blades reaching  $\frac{1}{4}$ – $\frac{1}{2}$  of the plant height . . . . . *M. arenicola*
76. Leaf blades arcuate, 0.3–0.9 mm wide, 1–3(5) cm long; usually lacking exposed culm nodes; most leaf blades reaching less than  $\frac{1}{5}$  of the plant height . . . . . *M. torreyi*
71. Plants erect, of medium height, culms (25)50–120 cm tall, leaf blades 10–50 cm long.
77. Panicle elongated, loosely contracted, generally longer than wide.
78. Lemma hyaline, densely villous, widely ovate-lanceolate, apex bifid, teeth 1 mm long, subacute, midvein prominent, reddish, continuous with an geniculate awn 10–12 mm long that is twisted near base . . . . . *M. lucida*
78. Lemma glabrous, not transparent, narrowly lanceolate, apex entire, midvein not prominent or reddish, awn flexuous, not twisted at the base.
79. Spikelets silvery-olive to reddish, 3–3.5 mm long; lemma awn 5–10 mm long; anthers 1–1.6 mm long . . . . . *M. argentea*
79. Spikelets never silvery-olive to reddish, 4.5–5 mm; lemma mucro or awn different in size; anthers 1.4–2.6 mm long.
80. Panicle 8–20(25) cm long; pedicels 3–20 mm long, capillary; lemma awn 2–7(10) mm long . . . . . *M. setifolia*
80. Panicle 15–50 cm long; pedicels 1–3 mm long, not capillary; lemma awn 10–40 mm long . . . . . *M. elongata*
77. Panicles almost as long as wide, open, loosely to densely flowered.
81. Spikelets 3.5–5.1 mm long; lemmas 3.5–5.1 mm long; paleas 3.5–5.1 mm long.
82. Lemmas scaberulous to scabrous, not smooth and shining, purple; leaf blades 1–3 mm wide, flat or involute, not falcate; culms usually with a single node; anthers purplish.
83. Lemma awned, awn 10–22 mm long; glumes 1–1.7(2) mm long, apex obtuse to subacute, sometimes erose . . . . . *M. rigida*
83. Lemma mucronate or shortly awned, awn or mucros 0.5–1(2) mm long; acute . . . . . *M. mucronata*
82. Lemmas glabrous, smooth and shining, stramineous; leaf blades 1–2.5 mm wide, tightly involute to falcate; culms usually with 2–4 nodes; anthers greenish . . . . . *M. setifolia*
81. Spikelets (2)2.4–3.6 mm long; lemmas 2.3–3.6 mm long; paleas (2)2.4–3.6 mm long . . . . . *M. purpusii*
69. Panicles narrow, contracted to loosely contracted, 0.2–3 cm wide; panicle branches usually closely appressed to loosely spreading.

84. Panicles spikelike, 0.2–1.2 cm wide, densely flowered, sometimes interrupted near the base; primary branches tightly appressed, the branches 0.1–4 cm long.
85. Culms (35)50–200 cm tall; panicles 15–60 cm long; sheaths rounded near the base.
86. Glumes 3.4–5.6 mm long, usually longer than the lemma, apex unawned and not mucronate; ligules (5)8–40(50) mm long; anthers 1.5–2.2, dark greenish . . . . . *M. macroura*
86. Glumes 1.8–3.2 mm long, shorter than the lemma, apex sometimes mucronate or short-awned, the awn up to 1.7 mm long; ligules 0.5–2(3) mm long; anthers 1.3–1.8 mm long, yellow to purple . . . . . *M. rigens*
85. Culms 15–60 cm tall; panicles (2)4–16 cm long; sheaths compressed-keeled near the base.
87. Lower glumes all 1-veined, unawned or mucronate, the mucros 0.5–1 mm long; branches with a single spikelet, or if in pairs, the upper and lower spikelets both perfect . . . . . *M. wrightii*
87. Lower glumes 2- or 3-veined and awned, the awns 1–5 mm long; branched with paired spikelets, the lower spikelet staminate or sterile and the upper spikelet perfect.
88. Upper leaf blades acuminate with slender awnlike seta 3–8(10) mm long; ligules (2)3–12 mm long; culms erect . . . . . *M. alopecuroides*
88. Upper leaf blades acute sometimes with a narrow bristle 0.5–3 mm long; ligules 0.5–3 mm long; culms erect to decumbent.
89. Ligules 0.5–1 mm long, truncate; blades generally short with navicular apex, obtuse to subacute . . . . . *M. phalaroides*
89. Ligules 2–3 mm long, acuminate and erose, usually auriculate with triangular lateral lobes 0.5–2.5 mm long; blades apex acute to mucronate, sometimes extending up to 3 mm as a slender seta . . . . . *M. phleoides*
84. Panicles narrow, (0.6)1–3 cm wide, loosely contracted to narrowly open; primary branches loosely appressed to spreading up to 70° from the rachises, the branches 0.4–8.5 cm long.
90. Lemmas unawned, mucronate (mucros less than 1 mm long), or awned, the awns 1–6 mm long.
91. Spikelet pedicels flexuous nodding to reflexed, capillary; lemmas with a thick covering of tawny to shiny silky hairs located on the midvein and margins; ligules(0.3)0.7–2(2.7) mm long, hyaline to opaque throughout . . . . *M. tricholepis*
91. Spikelet pedicels erect, not flexuous nodding to reflexed or capillary; lemmas without a thick covering of tawny to shiny silky hairs on the midvein and margins, usually glabrous, puberulent throughout, or densely villous only on the margins below; ligules 4–35 mm long, firm below and often brownish.
92. Spikelets 3.8–5 mm long; basal sheaths terete; anthers 1.5–2.2 mm long, greenish; ligules not decurrent and brownish below.
93. Glumes 1.8–2.5 mm long, apex obtuse, veins inconspicuous, less than ½ the length of the spikelet; lemma awn 0.5–6 mm long . . . . . *M. dubia*
93. Glumes 2.5–3 mm long, apex acuminate to mucronate, ½ or more the length of the spikelet, lemma awn 5–10 mm long . . . . . *M. palmeri*
92. Spikelets 2.4–3.5 mm long; basal sheaths compressed-keeled or flat; anthers 1.1–1.6 mm long, yellowish or purplish; ligules decurrent, brownish below.
94. Glumes longer than the florets, glabrous and without hairs, scabrous or smooth; lemmas glabrous, scabrous or smooth, rarely puberulent; ligules 10–35 mm long . . . . . *M. lindheimeri*
94. Glumes shorter than the florets, pubescent especially near the base; lemmas villous on the lower ½ and margins below; ligules 5–13 mm long . . . . . *M. pubigluma*
90. Lemmas awned, the awns 8–40 mm long (5–10 mm in *M. argentea*).
95. Leaf blades 20–50 cm long, mostly involute.
96. Ligules 2–8 mm long, firm below, membranous at the apex, obtuse to acute; panicle green or tawny . . . . . *M. elongata*

96. Ligules 1–3 mm long, firm, truncate, membranous, minutely ciliate; panicles with purple spots ..... *M. palmeri*
95. Leaf blades 2–20 cm long, flat to involute.
97. Panicles loosely spreading, ovoid or pyramidal, 6–20 cm long, branches spreading; anthers 0.9–1.6 mm long.
98. Spikelets silvery-olive to reddish ..... *M. argentea*
98. Spikelets never silvery-olive to reddish.
99. Plants decumbent, wiry, delicate; lemma awn 10–30 mm long; glumes  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the lemma ..... *M. tenuifolia*
99. Plants erect, never decumbent, nor wiry, nor delicate; lemma awn (5)10–20 mm long; glumes less than  $\frac{1}{2}$  as long as the lemma ..... *M. alamosae*
97. Panicles narrow, spiciform, 2–15 cm long, branches appressed or ascending; anthers 1.5–3 mm long.
100. Lemma and palea generally glabrous; ligules with lateral lobes 1.5–3 mm long ..... *M. pauciflora*
100. Lemma appressed-pubescent on the central vein and margins, paleas appressed-pubescent between the veins; ligules without lateral lobes.
101. Glumes 0.3–1.1 mm long, less than  $\frac{1}{2}$  as long as the lemma, apex obtuse to acute ..... *M. purpusii*
101. Glumes (1)1.2–2.8 mm long, more than  $\frac{1}{2}$  as long as the lemma (at least the upper glumes), apex acute to acuminate.
102. Anthers 1.5–2 mm long, orange; lemmas elliptic, widest near the middle; culms strigulose below the nodes ..... *M. polycaulis*
102. Anthers 0.9–1.5 mm long, yellowish; lemmas lanceolate, widest near the base; culms scaberulous below the nodes ..... *M. tenuifolia*

**202. *Muhlenbergia alamosae*** Vasey, Bot. Gaz. 16(5): 146–147. 1891.

Perennial plant; erect. Culms 30–70 cm tall, glabrous. Sheaths 3.5–6.5 cm long, rounded; ligules 1–4 mm long, membranous, hyaline; blades 5–15 cm long, 1–3 mm wide, flat. Panicles 6–12 cm long, 2.5–3.5 cm wide, partially included in the superior sheath, ovoid, spreading with ascending ramifications, twigs 3.5–5 cm long, lateral pedicels shorter than spikelets. Spikelets 2–3.2 mm long, hyaline with prominent veins, green to purple; glumes 1–2 mm long, glabrous, 1-veined, veins green to purple, ovate-lanceolate, mucronate, lower glumes 1–1.5 mm long, the mucro 0.5 mm long; upper glumes 1.5–2 mm long, the mucro 0.5–1 mm long; lemma 2–3.2 mm long, subulate, pilose only at the base, scabrous at the apex, 3-veined, veins green, lemma awn (5)10–20 mm long; palea equal to lemma; anthers 1–1.2 mm long, yellow. Caryopsis 1–1.2 mm long, 0.3–0.4 mm wide, fusiform.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia alamosae* grows in grasslands and pine-oak forests at elevations of 1,150–2,450 m. It occurs in Mexico in Aguascalientes, Baja California Sur, Chihuahua, Durango, Guanajuato, Jalisco, México, Morelos, Puebla, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, 1700 m, *Gentry* 8089 (MEXU, US). **Guachochi:** 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson*

& *Annable* 10807 (US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson*, *M.B. Knowles*, *C.H. Dietrich* & *S.M. Braxton* 13573 (US). **Madera:** Puerto de El Tenedor, ejido El Long, 2450 m, *O. Bravo* 1929 (CHAPA, CIIDIR). **Ocampo:** overlook of Cascada de Basaseachic, approx. 37 mi W of Tomochic, 22 Sep 1986, 2200 m, *P.M. Peterson* & *Annable* 4548 (US); Parque Nacional Cascada de Basaseachic, 1620 m, *Spellenberg*, *Soreng*, *R. Corral* & *T. Lebegue* 8038 (CIIDIR); 5.25 km NW of Pinos Altos on road to Las Baterías, at the crossing of río Haciendita, 1700 m, *Spellenberg* & *P.S. Martin s.n.* (MEXU). **Temósachi:** Nabogame, 2200 m, *Laferr.* 1396 (MEXU).

**203. *Muhlenbergia alopecuroides*** (Griseb.) P. M. Peterson & Columbus, *Madroño* 55(2): 159. 2008.

*Lycurus setosus* (Nutt.) C. Reeder.

FIGURE 148

Caespitose perennial. Culms 30–60 cm tall, erect, scabrous to puberulent just above or below the nodes. Sheaths usually 1–5 cm long, glabrous to pubescent, compressed-keeled near base; ligules (2)3–12 mm long, acuminate to erose, sometimes with lateral lobes the same length as the ligule, the lateral lobes decurrent below; blades 4–10(2) cm long, 1–2.5 mm wide, flat or folded, glabrous to puberulent below and puberulent to hirsute above, margins and midvein whitish-thickened, apex acuminate

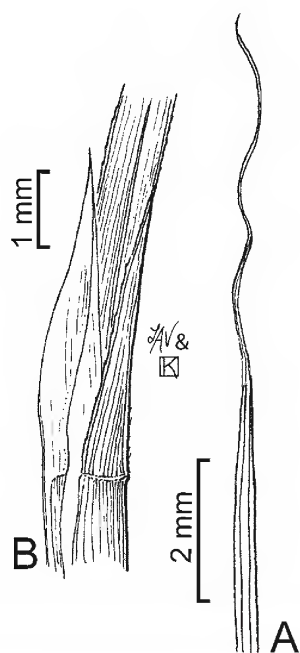


FIGURE 148. *Muhlenbergia alopecuroides*. A. Leaf blade apex. B. Ligule. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

with slender awnlike seta, 3–8(10) mm on the upper blades. Panicles (2)4–10 cm long, 4–8 mm wide, contracted, narrow, densely flowered, and spikelike; primary branches 0.1–0.3 cm long, tightly appressed. Spikelets 3–4 mm long, 1-flowered; glumes 1–2 mm long, scaberrulous near apex, awned, the awns 1–5 mm; lower glumes usually 2(3)-veined; upper glumes 1-veined, awns 2–5 mm; lemmas 3–4 mm long, puberulent along the margins, awned, the awns 1–3 mm; paleas 3–4 mm long, puberulent between the veins; anthers 1.5–2 mm long, yellow. Caryopsis 1.8–2.2 mm long, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia alopecuroides* grows in wooded canyons, rocky slopes, desert grasslands, and rock outcrops with *Pinus* spp., *Quercus* spp., *Cupressus* spp., *Abies* spp., *Cornus stolonifera*, *Ceanothus* spp., and *Yucca* spp. It occurs in northwestern Mexico in Baja California, Chihuahua, Durango, and Sonora, extends into the southwestern United States, and is disjunct in northwestern Argentina and Bolivia; 1,400–2,500 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5366 (UACJ); 10 km del entronque [junction] a Casas Grandes carr [hwy] Chih.–Cd. Juárez, 8 Aug 1979, pastizal [pastureland], 1525 m, M.E. Siqueiros 267 (MEXU). **Balleza:** 56.4 km W of

Parral on road to Balleza and 35.5 km S of Balleza, 18 Sep 1991, pine forest–encino [oak], 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10707 (CIIDIR); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20024, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, pine forest, 1891 m, P.M. Peterson & P. Catalán 17533 (US). **Casas Grandes:** Valle de las Cuevas al S del Ejido Ignacio Zaragoza, pine forest, 25 Sep 1982, 1760 m, Tenorio 1707 & Romero (ENCB, MEXU); 0.5 mi E of Cuesta Blanca, W of Casas Grandes, 4 Sep 1958, Reeder, C. Reeder 3229 (US); 9 mi NE of Cuesta Blanca, W of Casas Grandes, 18 Sep 1960, Reeder, C. Reeder & Soderstrom 3554 (ARIZ, US); Rancho Tapietas de Casas Grandes a Col. Hidalgo aprox 20 km desviar a la derecha por terracería [divert right by dirt road] 12 km, 3 Oct 2000, pastizal, G. Gómez 112 (MEXU). **Chihuahua:** Mapula Mts, 11 Nov 1886, C.G. Pringle 904 (MEXU); Sierra Azul, (Sierra Mapula), 10 Sep 1934, Pennell 18648 (US); 6.1 mi W of Hwy 45 on dirt road towards Santa Clara, 18 Oct 1992, bosque de encino [oak forest], 1640 m, P.M. Peterson & Annable 12584 (US); 16.7 mi W of Hwy 45 on road up Los Prietos Canyon, 18 Oct 1992, pine forest, 2120 m, P.M. Peterson & Annable 12595 (US); 13 km al N de la Cd. de Chihuahua carr. Chih.–Cd. Juárez, encinar–pastizal [oak grove–pastureland], 18 Aug 1996, C. Yen & E. Estrada 5484 (ENCB); Base de la Sierra de La Campana, 80 km al N de Chihuahua, ladera riolítica [rhyolitic hillside] con pastizal & encinos, 19 Oct 1974, 1700 m, Rzedowski 32309 (ENCB); Ejido col Ocampo, 13 Jul 1976, pastizal, 1500 m, Blanco35 (MEXU); Rancho Tepehuanes de Chihuahua hacia [toward] Namiquipa desviar en Campo 73 a la derecha terracería 6 km, 11 Oct 2000, pastizal, G. Gómez 306 (MEXU); Rancho Aguja de Chihuahua hacia Namiquipa desviar en Campo 73 a la derecha terracería 6 km, 12 Oct 2000, pastizal, G. Gómez 321 (MEXU). **Cuahtémoc:** about 11 mi W of Cuahtémoc, 5 Oct 1966, steep mountain slope with pines, oaks, and junipers. 7600 ft, Reeder & C. Reeder 4596 (ENCB, MEXU); 12 mi W of Cuahtémoc, 5 Sep 1967, 7000 ft, Reeder & C. Reeder 4861 (ARIZ, ENCB); 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2110 m, P.M. Peterson & Annable 12547 (US). **Cusihuiriachic:** Rancho El Coronel, 2 Sep 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], 2500 m, Loya & Méndez1506 (MEXU). **Guachochi:** 5.8 mi N of Creel on road (hwy 25) towards San Juanito, 5 Oct 2000, pine forest, 2480 m, P.M. Peterson & J. Cayouette 15365 (US); NW of Cusarare, 23 Aug 1973, pine–oak, 6900 ft, Bye 4746b (MEXU). **Guerrero:** Girasol, on railroad NW of San Isidro, Sierra Madre Occidental, 18 Sep 1934, F.W. Pennell 18984 (US); 35.4 km SW of La Junta and approx. 74 km N of Creel, 24 Sep 1988, pine woods, 2200 m, P.M. Peterson & Annable 5835 (ENCB, US); 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, P.M. Peterson, Annable & Y. Herrera 7991 (ENCB, US). **Gran Morelos:** 47 mi W of Cd. Chihuahua on hwy 16, 7 Oct 1972, 6000 ft, L. H. Harvey & J.T. Wither-spoon 9294 (ENCB). **Hidalgo del Parral:** 14 mi E of Parral, 6

Sep 1967, *Reeder & C. Reeder* 4877 (US); NE edge of Parral, 30 Sep 1959, *Correll* 22683 (ENCB); 5 mi S of Parral, 7 Oct 1966, *Reeder & C. Reeder* 4814 (ARIZ). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, pine woods, 2400 m, *P.M. Peterson & R.M. King* 8148 (ENCB). **Jiménez:** 20 mi NW of Chih.-Dgo. State line, along hwy 45, 7 Sep 1967, 1737 m, *Reeder & C. Reeder* 4890 (US). **Madera:** Along railroad N of Madera, 19 Sep 1934, *Pennell* 18996 (US); Mesa del Yerbánis, ejido El Long, 12 Oct 1990, bosque de *Quercus*, 1900 m, *O. Bravo* 1855 (CIIDIR, ENCB, MEXU). Proximidad a la Col. Chuichupa, 1 Sep 1990, pastizal & bosquete [grove] de *Juniperus*, 2240 m, *A. Benítez* 2165 (CIIDIR, ENCB). **Matachic:** SW of Matachic on slope on NW side of ridge near km 9.7 on Matachic-Cocomoarachic road, 29 Aug 1978, pine-oak, 1900 m, *Bye* 9008 (MEXU). **Matamoros:** 9 mi S of Villa Matamoros, 7 Sep 1967, *Reeder & C. Reeder* 4884 (US); 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, *P.M. Peterson & Annable* 5983 (ENCB, US). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P.M. Peterson & Annable* 5763 (US); 5776b (ENCB, US); 11.3 km W of Nuevo Majalca, 25.7 km W on Hwy 45, 22 Sep 1988, 1800 m, *P.M. Peterson & Annable* 5786 (US). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, *P.M. Peterson & Annable* 5959 (ENCB, US).

**204. *Muhlenbergia annua*** (Vasey) Swallen, Contr. U.S. Natl. Herb. 29(4): 204. 1947.

Annual; small plants. Culms 8–20 cm tall, erect, internodes short, 3–25 mm long, glabrous, scabrous below nodes. Sheaths 2–25 mm long, glabrous to scabrous, margins hyaline; ligules 1.6–2.5 mm long, hyaline, apex irregularly toothed to lacerate, acute, margins entire; blades 1–6 cm long, 0.8–1.5 mm wide, flat to involute, midvein evident, short-pubescent adaxially, scaberulous abaxially. Panicle 5–13 cm long, 1.4–6 cm wide; branches 10–36 mm long, 1 or 2 per node, slender, scattered florets, ascending or extended; pedicels 3–8 mm long, slender, erect, nodes 9–22 per inflorescence. Spikelets 1.4–2.2 mm long, with antocian spots when immature; glumes 1.5–2.1 mm long, equal in length and larger than lemma, glabrous, often with a central vein, prominent, apex acuminate to short-awned, awn not longer than 0.3 mm long; lemma 1.4–1.7 mm long, oblong-elliptic, densely appressed-pubescent on the midvein and margins; palea 1.1–1.7 mm long, oblong-elliptic, densely appressed-pubescent on the lower  $\frac{3}{4}$ , apex acute; anthers 0.5–0.6 mm long, purplish. Caryopsis 0.9–1.1 mm long, fusiform to ellipsoid, brownish-gray.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia annua* grows on gravelly soils in pine-oak forests at elevations of 2,000–2,270 m. It is uncommon in Mexico, known from the Sierra Madre Occidental in Chihuahua, Durango, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20022, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR,

US). **Bocoyna:** 18.7 mi S of San Juanito on road to Creel, 2200 m, *P.M. Peterson & Annable* 7999 (US). **Casas Grandes:** 25 mi SW on Col. Juárez road to Hernández Javales, *P.M. Peterson & Annable* 4036 (TAES, US); About 43 mi SW of Casas Grandes, 2100 m, *Reeder & C. Reeder* 2691 (MEXU, US); 1 mi W of Cuesta Blanca, W of Casas Grandes, 2012 m, *Reeder & C. Reeder* 3223 (MEXU, US); 1 mi N of Cuesta Blanca, 25.4 mi from Col. Juárez, *P.M. Peterson & Annable* 4046 (US); 15.5 mi W of La Junta on road to Tomóchic, 15 km mark on Hwy 16, 2100 m, *P.M. Peterson & Annable* 4053 (US). **Chihuahua:** Chihuahua, 1885, *E. Palmer* 4A (US), holotype. **Guachochi:** 10.6 mi NE of La Bufa on road to Creel, *P.M. Peterson & Annable* 8072 (US); 16.6 km NE of La Bufa and 6.7 km S of Basigochi, 2130 m, *P.M. Peterson, Annable & Valdés-Reyna* 10814 (US); Norogachic, 2320 m, *E. Palmer* 4a (US); Flat rock outcrops at Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17672 (CIIDIR, US); Arroyo Baqueachi, at 5 km E of small village, 2004 m, *P.M. Peterson & P. Catalán* 17567 (CIIDIR, US). **Guerrero:** 15.5 mi W of La Junta on road to Tomóchic, 15 km mark on Hwy 16, 4 Sep 1985, *P.M. Peterson & Annable* 4053 (US); 24 mi SW of La Junta on road to Creel, 2270 m, *P.M. Peterson & Annable* 9612 (US); 18.7 mi N of San Juanito on road to Creel, 10 Sep 1989, *P.M. Peterson, Annable & Y. Herrera* 7999 (US).

**205. *Muhlenbergia arenacea*** (Buckley) Hitchc., Proc. Biol. Soc. Washington 41: 161. 1928.

FIGURE 149C–G

Rhizomatous perennial. Culms 10–30(40) cm tall, decumbent, terete to somewhat compressed-keeled near the base; internodes scaberulous below the nodes. Sheaths about  $\frac{1}{2}$  as long as the internodes, margins hyaline; ligules 0.5–2 mm long, hyaline, with lateral lobes or auricles 1–2 mm; blades 0.7–4(6) cm long, 0.5–1.7 mm wide, flat, occasionally folded, tapering, scabrous abaxially, strigulose adaxially, margins and midveins thickened, whitish, apex narrow, often sharp, erose. Panicles 5–15 cm long, 4–14 cm wide, broadly ovoid, open; primary branches 2–8 cm long, capillary, straight to slightly flexuous, diverging 45°–80(100)° from the rachises, never appearing involucre, naked proximally; pedicels 1–11 mm long, usually longer than the spikelets. Spikelets 1.5–2.5 mm long, occasionally with 2 florets; glumes 0.9–2 mm long, equal, 1-veined, usually acute to acuminate, occasionally erose and mucronate, mucros to 0.2 mm; lemmas 1.5–2.5 mm long, lanceolate to oblong-elliptic, plumbeous to purplish, sparsely appressed-pubescent on the lower  $\frac{1}{2}$  of the margins and midveins, hairs to 0.3 mm long, apex acute to obtuse, sometimes shallowly bilobed, mucronate, mucros to 0.3 mm; paleas 1.5–2.6 mm long, lanceolate, glabrous, obtuse to acute; anthers 1–1.5 mm long, yellowish to purplish. Caryopsis 1–1.3 mm long, elliptic, brownish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia arenacea* grows on sandy flats, plains, alluvial fans, washes, depressions, and alkaline mesas in open grasslands at elevations of 1,000–2,200 m. It ranges from the southwestern United States to



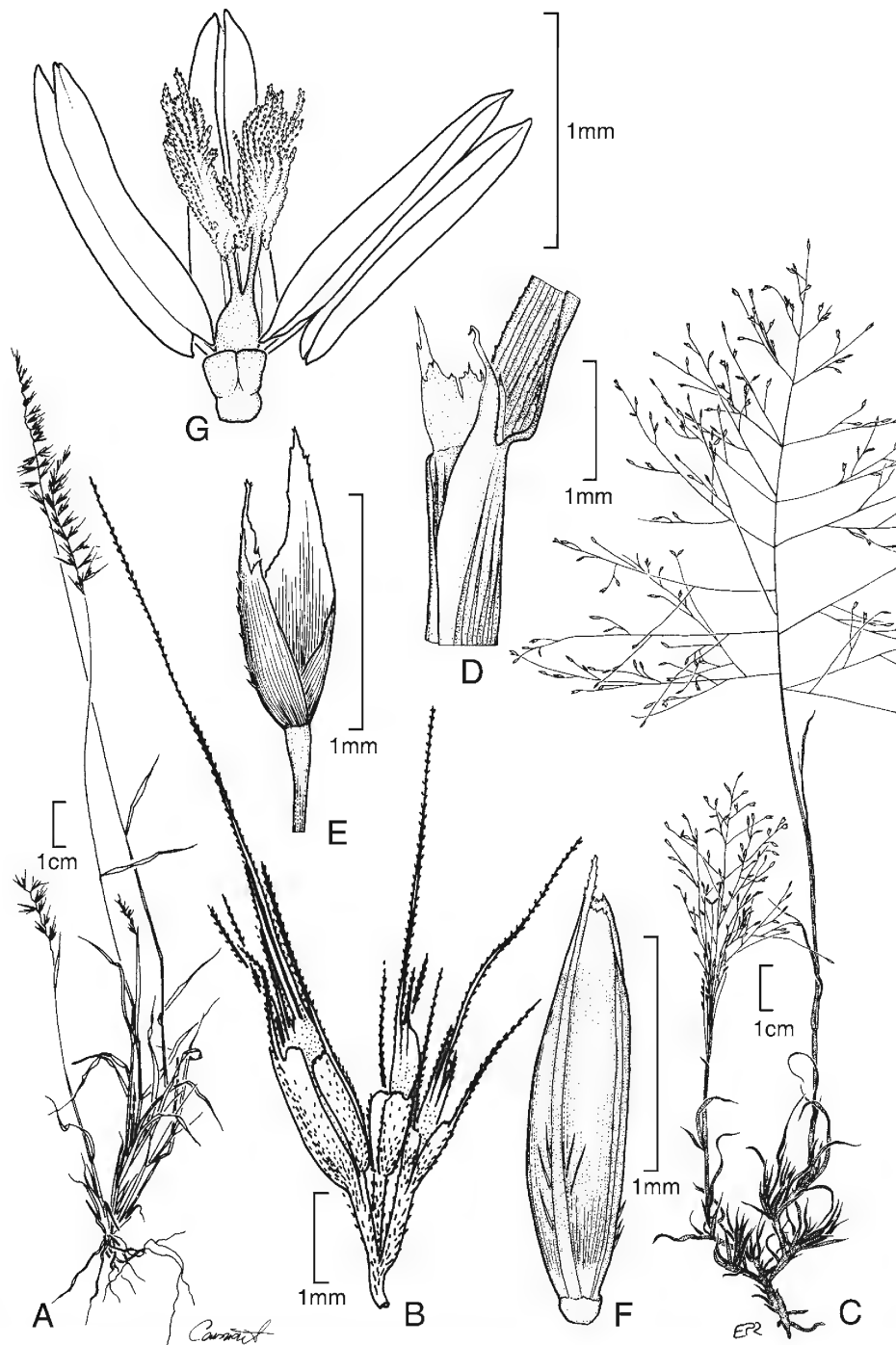


FIGURE 149. *Muhlenbergia unisetata*. A. Habit. B. Inflorescence branch. *Muhlenbergia arenacea*. C. Habit. D. Ligule. E. Glume. F. Floret. G. Lodicules, pistil, and stamens. Drawn by Susan C. Escher and Elisabeth P. Roberts for Smithsonian Institution, Department of Botany.

northern Mexico in Chihuahua, Hidalgo, San Luis Potosí, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Rancho El Torreño, 1150 m, *G. Melgoza* 54 (CIIDIR). **Ascensión:** Al SE del rancho El Caballo, 1200 m, *M.A. López s.n.* (INEGI). **Camargo:** 15 mi W of Jiménez, 1398 m, *Reeder & C. Reeder* 4874 (ENCB); In arroyo 50 km N of Jiménez, 1 Aug 1939, 1270 m, *L. H. Harvey* 1375 (TAES, US). **Casas Grandes:** 20 km al SE de Nuevo Casas Grandes, 2100 m, *Hern.-Xol-10438* (CHAPA); 7 km NW de Casas Grandes, faldas del cerro [hill-sides] El Pajarito, 1900 m, *Hern.-Xol-10441* (CHAPA). **Jiménez:** 10 mi E of Carrillo, 21 Sep 1938, *F. Shreve* 8863 (US).

206. *Muhlenbergia arenicola* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 91. 1862.

FIGURE 150

Caespitose perennial. Culms (15)20–60(70) cm tall, somewhat decumbent, 1 or more nodes exposed; internodes hirsute below the nodes. Leaves somewhat basally concentrated, most blades not reaching more than  $\frac{1}{4}$ – $\frac{1}{2}$  of the plant height; sheaths usually a little shorter than the internodes, not keeled, scaberulous, margins hyaline, basal sheaths rounded, not becoming spirally coiled when old; ligules 2–9 mm long, hyaline, acute, lacerate, often with lateral lobes; blades 4–10(16) cm long, 1–2.2 mm wide, not arcuate, flat, folded, or involute, scabrous, often glaucous, midveins and margins not thickened, green. Panicles 12–30 cm long,



FIGURE 150. *Muhlenbergia arenicola*. A. Habit. B. Floret. C. Glumes. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

5–20 cm wide, diffuse; primary branches 1–10 cm long, diverging 30°–80° from the rachises, naked basally; pedicels 1–4(6) mm long, erect. Spikelets 2.5–4.2 mm long; glumes 1.4–2.5 mm long, equal, 1-veined, apex scaberulous, acute to acuminate, minutely erose, sometimes mucronate, the mucros to 1 mm long; lemmas 2.5–4.2 mm long, narrowly elliptic, usually purplish, scabrous distally, appressed-pubescent on the lower  $\frac{1}{2}$ – $\frac{3}{4}$  of the margins and midveins, apex acuminate, awned, awns 0.5–4 mm long; paleas 2.5–3.5 mm long, narrowly elliptic, intercostal region sparsely pubescent, apex acuminate, with 2 short mucros 0.1–0.2 mm long; anthers 1.5–2.1 mm long, greenish. Caryopsis 1.9–2.3 mm long, fusiform, brownish.  $2n = 80, 82$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia arenicola* grows on sandy mesas, limestone benches, and in open desert grasslands, associated with *Bouteloua gracilis*, *B. uniflora*, and *Larrea tridentata*, at elevations of 600–2,135 m. The range of *M. arenicola* extends to southwestern United States, and the species is disjunct in northwestern Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 7 km al W de Sueco carr. [hwy] Sueco–Buenaventura, 1300 m, *Valdés-Reyna* VR-728 (ENCB). **Camargo:** 2 mi S of San Fernando, 40 mi NE of Camargo, 25 Sep 1938, *I.M. Johnston* 7938 (US); In arroyo 50 km N of Jiménez, 1 Aug 1939, 1280 m, *L. H. Harvey* 1370 (US). **Chihuahua:** Hills near Chihuahua, 1800 m, *C.G. Pringle* 479 (US); 13 mi N of Parrita, 1460 m, *Reeder, C. Reeder & Soderstrom* 3488 (US); 12 mi N of Chihuahua, 1800 m, *Hern.-Xol. & V. Mathus* N-1747 (CHAPA). **Jiménez:** 8 mi SW of Jiménez, 1300 m, *Reeder, C. Reeder & Soderstrom* 3459 (US); 10 mi E of Carrillo, 21 Sep 1938, *F. Shreve* 8847 (US); W slope, Sierra de Sta Eulalia, 1280 m, *L. H. Harvey* 1537 (US). **López:** 15 mi W of Jiménez, 1398 m, *J.R. Reeder & C. Reeder* 4875 (ENCB). **Manuel Benavides:** 1 mi E of Pozo de Villa on Coahuila boundary, along rd from Ojinaga to Castillón, 1200 m, *I.M. Johnston* 8180 (US).

207. *Muhlenbergia argentea* Vasey, Bull. Torrey Bot. Club 13(12): 232. 1886.

FIGURE 151A–E

Caespitose perennial. Culms 30–50 cm tall, decumbent near base, glabrous, strigulose below nodes. Sheaths 2–8 cm long, glabrous to strigulose, margin hyaline, old sheaths folded; ligules 5–9 mm long, hyaline, delicate, margin erose, apex lacerate; blades 2–16 cm long, 0.4–2 mm wide, flat to involute, occasionally folded, apically acuminate, strigulose adaxially, scabrous abaxially, central midvein and margins evidently hardened and whitish. Panicle 6–16 long, 0.7–3.5 cm wide, included to short-exserted, narrow to loosely spreading; branches 1–4.5 cm long, ascending, appressed or diverging up to 45° from rachis; rachis scabrous. Spikelet 3–3.5 mm long, silvery-olive to reddish, pedicels 0.6–4.5 mm; glumes 1.5–2.3 mm long, green, subequal, glabrous to scabrous, oblong-lanceolate, 1-veined, mucronate, mucro 0.3–0.6 mm long; lemma 2.8–3.7 mm long, oblong-elliptic, appressed-pubescent along margins and midvein at the inferior  $\frac{1}{2}$ , hairs to

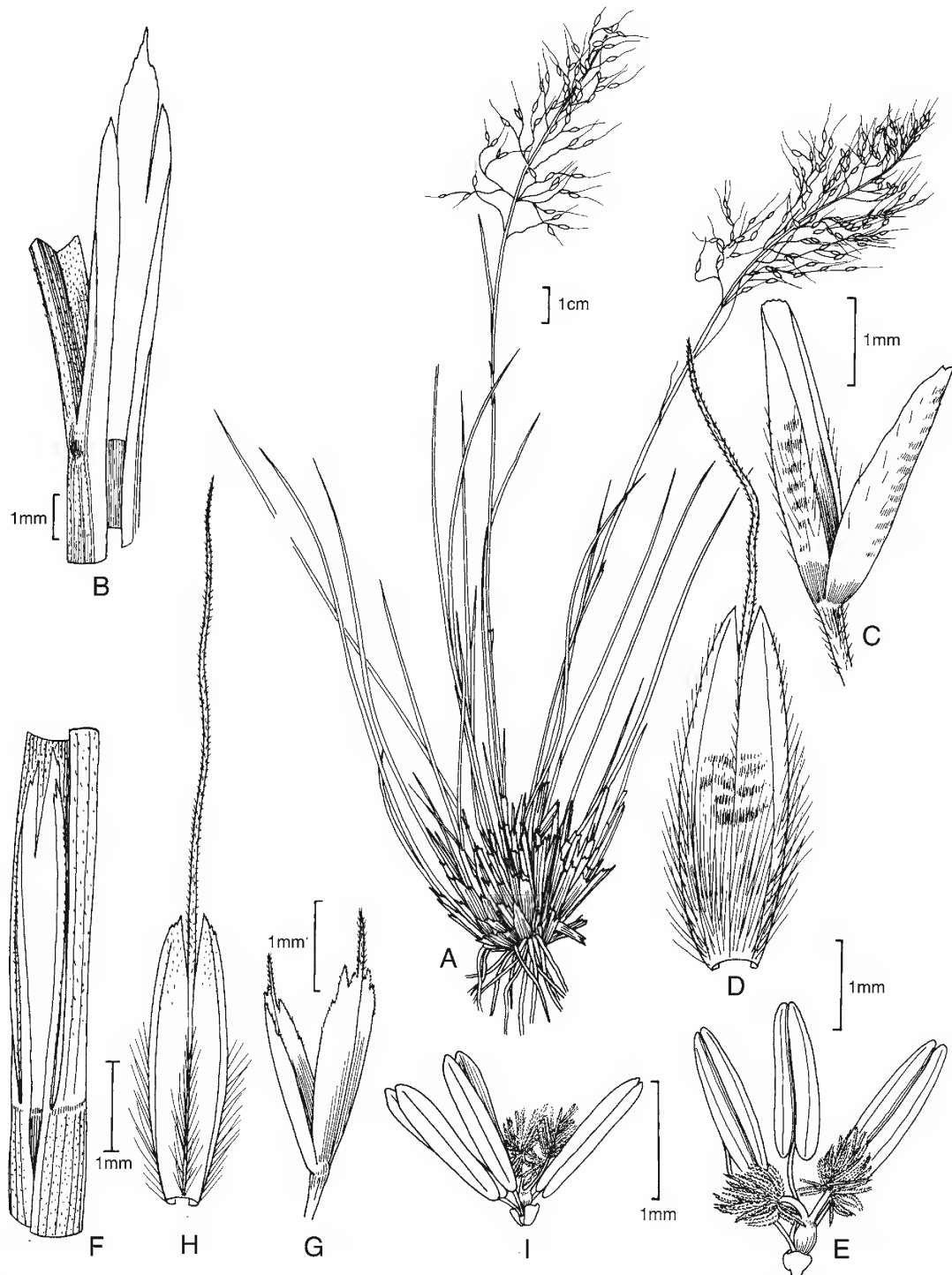


FIGURE 151. *Muhlenbergia argentea*. A. Habit. B. Ligule. C. Glumes. D. Lemma. E. Lodicules, pistil, and stamens. *Muhlenbergia lucida*. F. Ligule. G. Glumes. H. Lemma. I. Lodicules, pistil, and stamens. Drawn by Cathy Pasquale for Smithsonian Institution, Department of Botany.

0.7 mm long, silver-olive, occasionally purplish, apex deeply bilobed, 0.5–1 mm long, lobes rounded to obtuse, awn 5–10 mm long, emerging between 2 lobes, flexuous, scabrous, silvery-olive to reddish close to base; palea 2.8–3.7 mm long, narrowly oblong-elliptic, pilose between veins toward the inferior  $\frac{1}{3}$ , apex obtuse to truncate; anthers 1–1.6 mm long, oblong, yellow-greenish. Caryopsis 1.4–1.6 mm long, fusiform, stramineous to light brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia argentea* grows below oak forests in rhyolitic rocks at elevations of 1,780–2,100 m and is endemic to Chihuahua. The species should be searched for in northern Durango and eastern Sonora, where it might also occur.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Hacienda San Miguel, near Batopilas, 2100 m, *E. Palmer* 160 (US); 8.9 km NE of La Bufa on road to Creel, 1780 m, *P.M. Peterson, Annable & Y. Herrera* 8066 (US). **Moris:** NW Chihuahua, near Sonora border, on Hwy 16 towards Maycoba, 1900 m, *P.M. Peterson & Annable* 12482 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna* 10808, 10810 (US); 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufa, 2000 m, *Y. Herrera, P.M. Peterson & Annable* 971 (CIIDIR); 24.6 km S of Mex Hwy 127 and 11.1 km NE of La Bufa, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 8044 (US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13577 (US). **Ocampo:** 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 2100 m, *P.M. Peterson & R.M. King* 8248 (US); Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable* 12526 (US); mirador [lookout] de Cascada Basaseachic, 7 Sep 2008, 2023 m, *P.M. Peterson & Saarela* 22095 (US).

208. *Muhlenbergia arizonica* Scribn., Bull. Torrey Bot. Club 15(1): 8, t. A, f. 1–6. 1888.

FIGURE 152

Caespitose perennial; non-rhizomatous. Culms 15–50 cm tall, erect to decumbent, hirsute to glabrous. Sheaths 0.8–6.5 cm long, rounded, hirsute basally, hyaline margin; ligules 1–2 mm long, hyaline, the apex obtuse, minutely erose; blades 4–7 cm long, 0.8–2 mm wide, flat to folded, midvein and margins hardened, white and cartilaginous, glabrous to scabrous. Panicle 8–20 cm long, 4–15 cm wide, diffuse, branches 1–7.5 cm long, spreading or ascending, basally naked, pedicels 3–16 mm long,

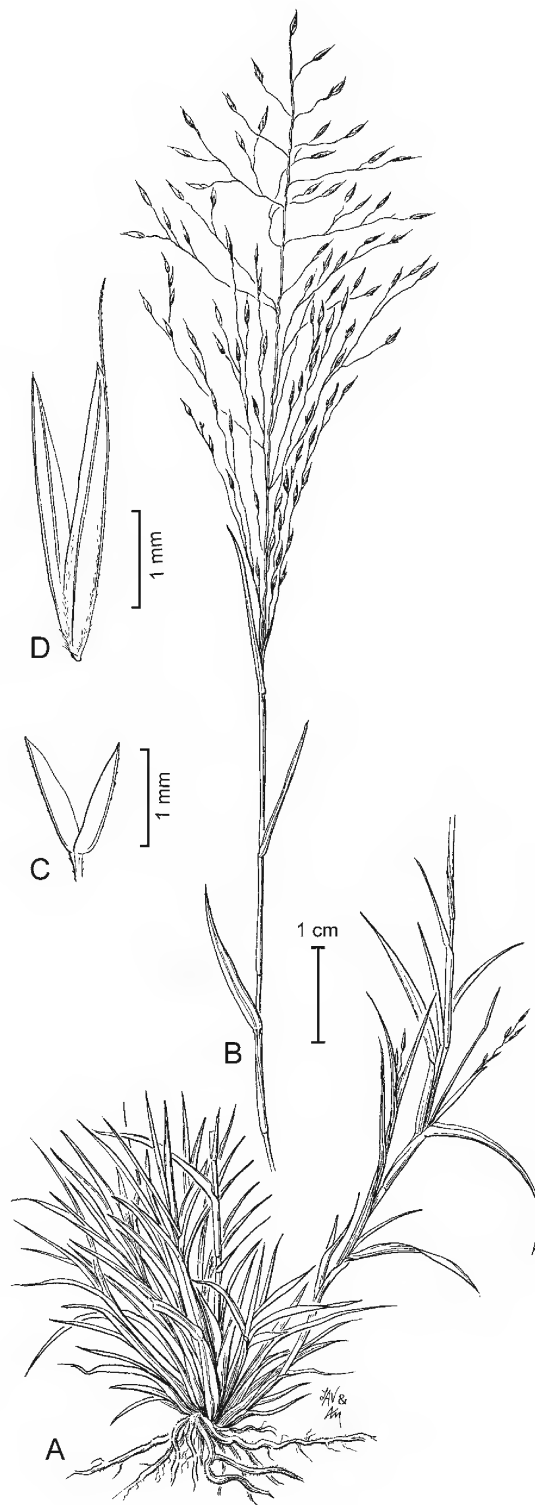


FIGURE 152. *Muhlenbergia arizonica*. A. Habit. B. Culm and inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

erect to flexuous. Spikelets 2–3.1 mm long, solitary at the end of branches and twigs; glumes 1–1.5 mm long, equal, 1-veined, scabrous to the apex, obtuse or acute, awnless; lemma 2–3.1 mm long, elliptic, purplish, appressed-pubescent in margins and midvein to the inferior ½, scabrous at superior ½, apex acute, lightly bifid, awn 0.5–1.1 mm; palea 2.1–3.1 mm long, elliptic, glabrous, apex acute; anthers 1.6–2.1 mm long, purplish. Caryopsis 1.3–1.7 mm long, fusiform, dorsally grooved, brown.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia arizonica* grows in grasslands, xerophilous scrub, and edges of cultivated areas at elevations of 700–2,270 m. It ranges from the southwestern United States to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 69.2 km al E de Guachochi and 25.7 km W of Balleza, 26 Sep 1988, 2100 m, P.M. Peterson & Annable 5940 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10701 (US); 16.1 km W of Balleza and 77.9 km E of Guachochi, 1990 m, P.M. Peterson, Annable & Valdés-Reyna 10741 (US); 11 mi SE of Balleza on road to Parral, 1800 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13531 (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, 1001 m, P.M. Peterson & J.M. Saarela 22173 (US). **Chihuahua:** Rocky hills near Chihuahua, 2190 m, C.G. Pringle 402 (ENCB); Hills near Chihuahua, 1800 m, C.G. Pringle 964 (MEXU, US). **Guerro:** 24 mi SW of La Junta on road to Creel, 2270 m, P.M. Peterson & Annable 9615 (US). **Hidalgo del Parral:** About 5 mi S of Parral, 1824 m, Reeder & C. Reeder 4612 (ENCB); 3 mi NE of Parral on Hwy 45 towards Chihuahua, 2000 m, M.E. Siqueiros 1549 (MEXU). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 1780, L. H. Harvey 1624 (TAES). **Madera:** 23.3 km SE of Madera on Mex 16 to La Junta, 29 Sep 1989, 2190 m, P.M. Peterson & R.M. King 8183 (US). **Matamoros:** 19.3 km S of Villa Matamoros on Hwy 45 to Dgo., 1988 m, P.M. Peterson & Annable 5981 (US); P.M. Peterson & R.M. King 8255 (US). **Riva Palacio:** 2.7 km W of Nuevo Majalca, 17.2 km W of Hwy 45, 22 Sep 1988, 1700 m, P.M. Peterson & Annable 5777 (US). **San Francisco del Oro:** 21 km W of Parral and 3.2 km N of Torreón-cillo, 26 Sep 1988, 2000 m, P.M. Peterson & Annable 5960 (US).

209. *Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi, Revista Fac. Agron. Veterin. (Buenos Aires) 6: 117, f.1. 1928.

FIGURE 153

Rhizomatous perennial; occasionally stoloniferous. Culms 10–60(100) cm tall, decumbent-ascending, bases somewhat compressed-keeled; internodes glabrous, shiny below the nodes. Sheaths glabrous, margins hyaline; ligules 0.2–1 mm long, firm, truncate, ciliate, without lateral lobes; blades 2–7(11) cm long, 1–2.8(4) mm wide, flat, occasionally folded, smooth or scaberulous in both surfaces, margins and midveins not conspicuously thickened, greenish, apex acute, not sharp. Panicles 6–21 cm long, 4–16 cm wide, broadly ovoid, open; primary branches

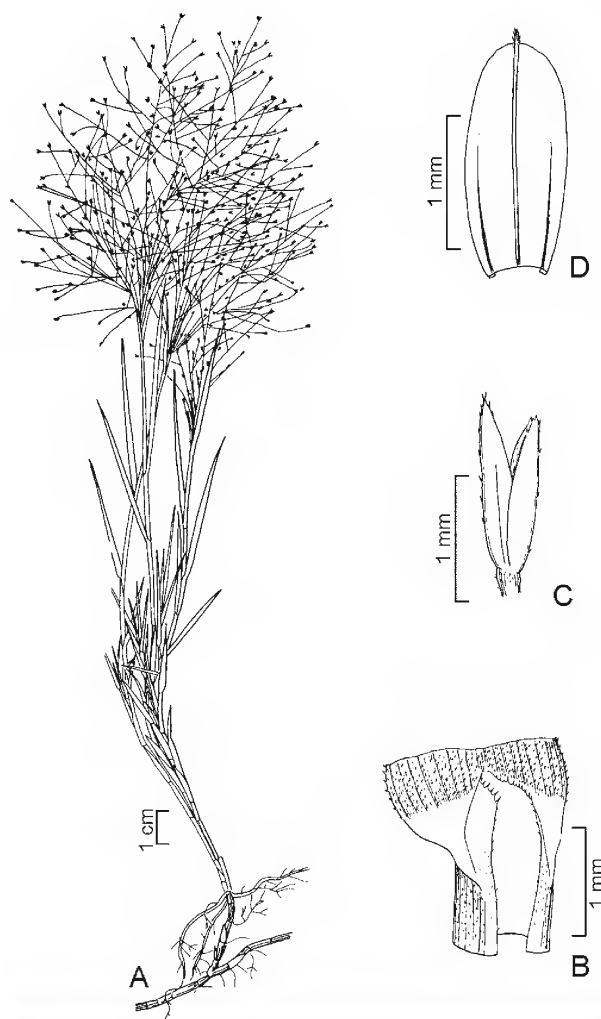


FIGURE 153. *Muhlenbergia asperifolia*. A. Habit. B. Ligule. C. Glumes. D. Lemma. Drawn by Elisabeth P. Roberts for Smithsonian Institution, Department of Botany.

3–12 cm long, capillary, lower branches spreading 30°–90° from the rachises, never appearing involucre; pedicels 3–14 mm long, longer than the spikelets. Spikelets 1.2–2.1 mm long, occasionally with 2 or 3 florets; glumes 0.6–1.7 mm long, equal, purplish, scaberulous, particularly on the veins, 1-veined, apex acute; lemmas 1.2–2.1 mm long, lanceolate to oblong-elliptic, somewhat plumbeous, glabrous, usually smooth, occasionally scaberulous near the apex, apex acute, awnless or mucronate, mucros to 0.3 mm long; paleas 1.2–2.1 mm long, lanceolate, glabrous, acute; anthers 1–1.3 mm long, greenish-yellow to purplish at maturity. Caryopsis 0.8–1 mm long, fusiform, brownish.  $2n = 20, 22, 28$ .



**DISTRIBUTION AND HABITAT.** *Muhlenbergia asperifolia* grows in moist, often alkaline meadows, beach margins, and sandy washes, on grassy slopes, and around seeps and hot springs at elevations of 5–3,000 m. This species is common in the western United States and Canada and is also found in Argentina, Bolivia, and Chile. In Mexico *M. asperifolia* occurs in Baja California, Chihuahua, Durango, Jalisco, and San Luis Potosí.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** Presa Encinillas, 100 km al N de Chihuahua, 1600 m, Rzedowski 32378 (MEXU); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, F.W. Gould 8912 (TAES). **Delicias:** About 9 mi N of Las Delicias, 1220 m, Reeder & C. Reeder 2615 (ENCB, MEXU, US). **Guachochi:** About 1 mi E of Boquilla Reservoir, 1277 m, Reeder & C. Reeder 4602 (ENCB, US). **Madera:** About 20 mi S of Madera, 2100 m, Reeder & C. Reeder 1240 (ENCB).

210. *Muhlenbergia biloba* Hitchc., Contr. U.S. Natl. Herb. 17(3): 294. 1913. *Bealia mexicana* Scribn., True Grasses 103–104, f. 45a. 1890.

Annual; small plants, often caespitose. Culms 9–35 cm tall, very branched at the inferior nodes, scaberulous-pubescent, striate, glabrous to minutely pubescent below nodes, internodes 2–10 mm long, hollow. Sheaths 2–7.5 cm long, keeled, usually striate, scaberulous to almost glabrous, longer than internodes, margin widely scarious; ligules 1.5–3.4 mm long, membranous, apex acute or rounded, irregularly toothed, margins entire, decurrent, ending in auricles, shorter than ligule; blades 1–7 cm long, 0.6–1.4 mm wide, flat, involute when dry, scaberulous abaxially, short-pubescent adaxially, midvein and margins white and hardened on adaxial surface. Panicles 3–10 cm long, 1.5–3.2 cm wide, spreading, branches 1.8–4.5 cm long, sinuose-ascending, 1(2) per node; pedicels 1–5.5 mm long, slender, dispersed, ascending, scabrous and minutely glandular, 6–16 nodes per inflorescence. Spikelets 3–4.8 mm long; glumes 3.2–4.8 mm long, 1-veined, equal, green-grayish, obtuse, sparingly pilose to villous, especially over proximal  $\frac{2}{3}$ ; lemma 2.9–3.5 mm long, sparingly to densely villous over the proximal  $\frac{2}{3}$ , hairs 0.5–0.7 mm long, lateral veins evident in the proximal  $\frac{1}{2}$ , apex bilobed, the lobes 1–1.4 mm long, rounded obtuse, awn 4–6.5 mm long, emerging between the lobes, scabrous, curly to flexuous; palea 2.6–3.4 mm long, apex obtuse, pubescence similar to the lemma; anthers 1.2–2.3 mm long, purple. Caryopsis 1.5–1.8 mm long, fusiform, brown-olive.  $n = 8$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia biloba* grows on sandy soils derived from calcareous rocks associated with pine forests at elevations of 1,780–2,300 m. It is an endemic species in Mexico found in Chihuahua, Durango, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 15 mi E of El Vergel on road to Parral, 21 Oct 1959, 7500 ft, Correll & Gentry 23270 (ENCB, US). **Chihuahua:** near Chihuahua, Oct 1886, C.G. Pringle 819 (ARIZ, NMC, US).

**Matamoros:** SE of Villa Matamoros on hwy 45 towards Durango, 22 Sep 1991, 1780 m, P.M. Peterson, Annable & Valdés-Reyna 10865 (US); 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, grassland, 1800 m, P.M. Peterson & Annable 5976 (ENCB, US); P.M. Peterson & R.M. King 8264 (US). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7946 (ENCB, US); 37 km W of Mex 45, and ca. 3.2 km W of Col. Cumbres de Majalca, 7 Sep 1989, pine forest, 2170 m, P.M. Peterson, Annable & Y. Herrera 7981 (ENCB, US); 23 mi W of Mex 45 and 2 mi W of Cumbre de Majalca, 8 Sep 1989, bosque de pino [pine forest], 2170 m, Y. Herrera, Peterson & Annable 915 (CIIDIR, ENCB); 1.2 mi W of Cumbres de Majalca, 22.6 mi W of hwy 45, 20 Sep 1986, 2200 m, P.M. Peterson & Annable 4529 (ENCB, NMC, US); Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 22 Sep 1988, 2200 m, P.M. Peterson & Annable 5800 (US); Majalca, 6 Sep 1935, 2080 m, LeSueur Mex-026 (US).

211. *Muhlenbergia brevis* C. O. Goodd., J. Wash. Acad. Sci. 31: 505. 1941.

FIGURE 154

Caespitose annual. Culms 3–20 cm tall, erect, slender, very branched at the base, scabrous to hispidule. Sheaths striate, glabrous or scabrous; ligule 1–3 mm long, thin, lacerate, often auriculate; blades 1–4.5 cm long, 1–2 mm wide, flat or involute, scabrous, with midveins and margins cartilaginous. Panicles 3–12 cm long, 0.5–1.8 cm wide, often included on the base, densely flowered, light green tinted with purple, branches 1–3.8 cm long, plicate-ascending, pedicels 0.2–8 mm. Spikelets 4–5 mm long, slender, in pairs, 1 spikelet sessile and another pedicelled, disarticulating below the pair of spikelets; glumes scabrous, unequal, shorter than lemma; lower glume 2–3.5 mm long, 2-veined, subulate, minutely to deeply bifid, the teeth slender, occasionally short-awned, awn 1.6–1.8 mm long, upper glume 2.4–4 mm long, entire, narrow, acuminate to attenuate, 1-veined, awned, awn to 2 mm; lemma 3.5–5 mm long, narrowly lanceolate, brown-green to purple, scabrous, appressed-pubescent between veins to base, apex acuminate, sometimes 2-teethed, awned, the awn 10–20 mm long, rigid to slightly flexuous, scabrous; palea similar to the lemma; anthers 0.5–0.9 mm long, purplish to yellowish. Caryopsis 2–2.8 mm long, narrow, fusiform, brown.  $2n=20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia brevis* grows on stony hills and gravel plains in grasslands and forests with *Pinus*, *Cupressus*, and *Quercus* at elevations of 1,700–2,400 m. It ranges from the United States to northern Mexico.

*Muhlenbergia brevis* and *M. depauperata* share various characters with *M. phalaroides*, *M. phleoides*, and *M. alopecuroides*, for example, spikelets in pairs, lower glumes 2-veined and 2-awned, upper glumes 1-veined and 1-awned, acuminate,

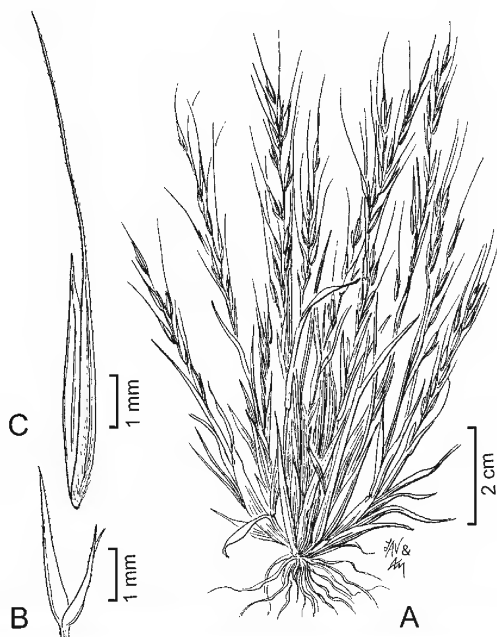


FIGURE 154. *Muhlenbergia brevis*. A. Habit. B. Glumes. C. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

lemmas with short-pubescent margins, and pubescent paleas. However, *M. brevis* and *M. depauperata* are sister found in the *Muhlenbergia* subg. *Bealia* (Scribn.) P. M. Peterson clade whereas the other three species are found in the *M. subg. Pseudosporobolus* (Parodi) P. M. Peterson clade (Peterson et al., 2010).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 15.6 mi NE of El Vergel on Hwy 24, 2000 m, P.M. Peterson & Annable 4061 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10706 (US). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7664 (US). **Casas Grandes:** 1 mi N of Cuesta Blanca, 25.4 mi from Col. Juárez, 2000 m, P.M. Peterson & Annable 4047 (US); Reeder & C. Reeder 3225 (US); 21 mi W of Col. Juárez, 2316 m, Reeder & C. Reeder 3210 (ENCB, US); 21 mi SW of Col. Juárez on road to Hernández Javales, 2200 m, P.M. Peterson & Annable 4030 (US); W of Casas Grandes, 5 mi S of Hernández, 2200 m, Reeder & C. Reeder 3507 (MEXU, US); 3 mi S of Hernández Javales, 32 mi SW of Col. Juárez, 2200 m, P.M. Peterson & Annable 4041 (US). **Cuahtémoc:** 16 mi W of Cuahtémoc, 2400 m, Reeder & C. Reeder 3468 (MEXU, US); 12 mi W of Cuahtémoc, 2128 m, Reeder & C. Reeder 2620, 3191 (CHAPA). **Chihuahua:** 39 km carr. [hwy] Chihuahua-Namiquipa, 2300 m, M. Vergara 179 (MEXU); 16.7 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, P.M. Peterson & Annable 12589 (US). **Guachochi:** 10.6 mi NE of La Bufa

on road to Creel, 2235 m, P.M. Peterson, Annable & Y. Herrera 8069 (US); Flat rock outcrops at Napuchis, 2140 m, P.M. Peterson & P. Catalán 17669 (CIIDIR, US). **Guerrero:** 24 mi SW of La Junta on road to Creel, 2200 m, Y. Herrera, P.M. Peterson & Annable 955 (ENCB); 9614 (US); 24 mi SW of La Junta on road to Creel, 2200 m, P.M. Peterson & Annable 5837 (US); P.M. Peterson, Annable & Y. Herrera 7998 (US); 16 km SW of La Junta on road to Creel, 2270 m, P.M. Peterson 9614 (US). **Hidalgo del Parral:** 15.7 mi W of Parral on Hwy 24 towards El Vergel, 2100 m, P.M. Peterson & Annable 4558 (US). **Ignacio Zaragoza:** Near Ignacio Zaragoza, 2100 m, A.A. Beetle M-8034 (MEXU); 12.6 mi NE of Ignacio Zaragoza, 2400 m, P.M. Peterson & R.M. King 8151 (US). **Madera:** 12 mi SW of Madera of Hwy 16 towards Cuahtémoc, 2100 m, P.M. Peterson & Annable 4051 (US); 2 mi N of Madera, 2165 m, Reeder & C. Reeder 2645 (MEXU); About 17 mi NW of Madera, 2195 m, Reeder & C. Reeder 2658 (CHAPA); About 15 mi S of Madera, mpio. Madera, 2190 m, P.M. Peterson & R.M. King 8178 (US). **Riva Palacio:** 2.7 km W of Nuevo Majalca, 17.2 km W of Hwy 45, 1700 m, P.M. Peterson & Annable 5774 (US); 0.9 km E of entrance to Parque Nacional, Col. Cumbres de Majalca, 2100 m, P.M. Peterson & Annable 5788 (US); 0.7 mi W of Nuevo Majalca, 8.5 mi W of Hwy 45, 1700 m, P.M. Peterson & Annable 4512 (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, P.M. Peterson, Annable & Y. Herrera 7941 (US).

212. *Muhlenbergia capillipes* (M. E. Jones) P. M. Peterson & Annable, Syst. Bot. Monogr. 31: 27. 1991. *Sporobolus capillipes* M. E. Jones, Contr. W. Bot. 14: 9. 1912.

FIGURE 155

Caespitose annual; fragile. Culms 15–40 cm tall, reddish, erect, glabrous, minutely scabrous below nodes. Sheaths glabrous to scabrous, margins hyaline; ligules 1.5–2.8 mm long, hyaline, apex toothed to lacerate, acute, occasionally with short auricles, decurrent; blades 3–12 cm long, 0.6–2 mm wide, flat to involute, midvein and margins hardened, short-pubescent to scabrous. Panicle 10–20 cm long, 3.5–8 cm wide; branches 1–5.5 cm long, 1–3 per node, ascending or spreading, pedicels 3–8 mm long, slender, capillary, curved and reflexed. Spikelets 1.3–1.8 mm long, widely spaced in the branches, inclined to reflexed, reddish when immature; glumes 1–1.2 mm long, equal, shorter than the lemma, glabrous, 1-veined, reddish especially near the base, apex obtuse to rounded, often irregular and minutely ciliate; lemma 1.3–1.8 mm long, widely ovate to lanceolate, glabrous, apex widely rounded to acute, reddish to slightly brown; palea 1.3–1.8 mm long, lanceolate, glabrous, apex rounded to acute; anthers 0.6–1.3 mm long, purplish. Caryopsis 1–1.2 mm long, fusiform, reddish-brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia capillipes* grows on sandy soils, rocky plains, and canyon walls in pine-oak forests at elevations of 1,400–2,400 m. It is an endemic species from Mexico growing in Chihuahua, Durango, and Sonora.

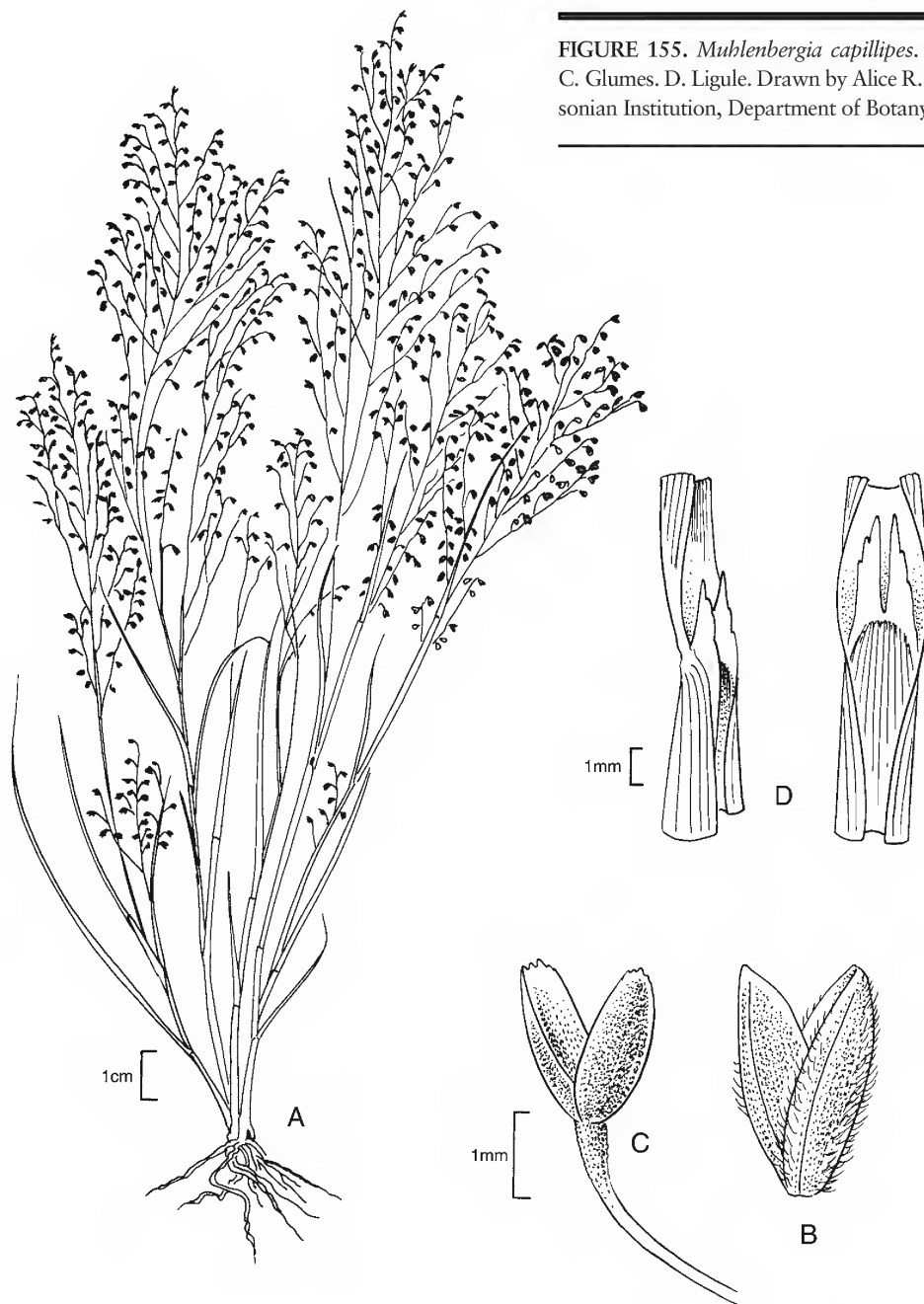


FIGURE 155. *Muhlenbergia capillipes*. A. Habit. B. Floret. C. Glumes. D. Ligule. Drawn by Alice R. Tangerini for Smithsonian Institution, Department of Botany.

*Muhlenbergia capillipes* is morphologically similar to *M. majalcensis*, but the former differs in having glumes shorter than the lemma.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Buenaventura:** 0.5 mi W of Flores Magón, 1400 m, *Reeder & C. Reeder* 3496 (US). **Casas Grandes:** W of Casas Grandes, 2 mi NE of Cuesta Blanca, 1980 m, *Reeder & C. Reeder* 3539 (US). **Chihuahua:** San Diego Mt, Sierra Madre Mts, *M.E. Jones s.n.* (US),

Type fragment. **Guerrero:** 24 mi SW of La Junta on road to Creel, 2200 m, *Y. Herrera, P.M. Peterson & Annable* 953 (ENCB); 23 mi SW of La Junta on road to Creel at the puente [bridge] Arroyo Ancho, 24 Sep 1988, 2230 m, *P.M. Peterson, Annable & Y. Herrera* 5858, 7993 (US); 35.4 mi W of La Junta on road to Parque Nacional Cascada de Basaseachic and 4.4 mi E of Tomochic, 30 Sep 1989, 2350 m, *P.M. Peterson & R.M. King* 8221 (US); 23 mi SW of La Junta on road to Creel at the puente Arroyo

Ancho, 2230 m, *P.M. Peterson & Annable 9604* (US); 16 km SW of La Junta on road to Creel, 2270 m, *P.M. Peterson & Annable 9618* (US); 37 km SW of La Junta on road to Creel at Puente Arroyo Ancho, 2230 m, *P.M. Peterson 9604* (US). **Ignacio Zaragoza:** 12.6 mi NE of Ignacio Zaragoza, 2400 m, *P.M. Peterson & R.M. King 8157* (US). **Madera:** 22 mi SE of Chuhichupa on the road to Madera, 2130 m, *Reeder & C. Reeder 2673* (US); 23.3 km SE of Madera on Mex 16 to La Junta, 29 Sep 1989, 2190 m, *P.M. Peterson & R.M. King 8182* (US). **Namiquipa:** Rancho Teseachic, 2000 m, *A.A. Beetle M-3266* (MEXU). **Temosachic:** Canyon Huahuatan, 10 mi SE of Madera, 22 Sep 1939, *C.H. Muller 7417* (US). **Uruáchi:** 16 mi W of Maycoba on Hwy 16 to Yécora, 1520 m, *Gentry & Bye 23353* (US).

**213. *Muhlenbergia cenchroides*** (Humb. & Bonpl. ex Willd.) P. M. Peterson, *Caldasia* 31(2): 280, f. 2C–D. 2009. *Aegopogon cenchroides* Humb. & Bonpl. ex Willd.

*Muhlenbergia brevigluma* (Scribn.) Columbus.

Caespitose annual; slender, sometimes producing stolons. Culms 30–40(50) cm tall, decumbent. Sheaths glabrous to puberulent; ligules 1.5–4.5 mm long, eciliate membrane; blades 2–11 cm long, 1–2 mm wide, scabrous or puberulent. Panicles 2–8 cm long, spreading, composed of unilateral racemes, racemes born along a central axis, bearing a triad of spikelets. Spikelets 4–6 mm long, central spikelet perfect, 3.5–5.5 mm long, sessile or with a pedicel less than 0.5 mm long; lateral spikelets pedicelled, staminate to rudimentary, pedicel a little longer, purple; glumes 3–5 mm long, 1-veined, linear to oblong, lobed, lobes acute, awned on apex, awn 1–3 mm; fertile lemma 2–3 mm long, laterally compressed, glabrous, membranous, dark brown, keeled, 3-veined, lateral veins ribbed, lemma apex 3-lobed, lobes lanceolate, acuminate, 3-awned, outer lobes longer; principal lemma awn 4–7 mm long; lateral lemma awns 1–2 mm long; palea 2.5–3 mm long, lanceolate, minute-pubescent dorsally, teeth awned, the awn 0.5–2 mm long; anthers 0.5–2 mm long, yellow.  $2n = 40, 60, 80$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia cenchroides* grows in humid areas in pine–oak forests at elevations of 1,600–2,320 m. It ranges from the United States and Mexico in Chiapas, Guerrero, Michoacán, Nayarit, Oaxaca, and Querétaro to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 43.5 km W of Balleza and 51.6 km E of Guachochi, 18 Sep 1991, bosque de pino [pine forest], 2320 m, *P.M. Peterson, Annable & Valdés-Reyna 10758* (CIIDIR). **Bocoyna:** 3.2 km al SE de Bocoyna rumbo [course] a Creel, 14 Aug 1976, Bosque de pino, 2270 m, *S. Gonzalez & J.M. Peña 674* (RELC). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela 22137* (US). **Chihuahua:** 38 km W of hwy 45 on road towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2230 m, *P.M. Peterson & Annable 12573* (US). **Guachochi:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 5 Sep 2008, 1890 m, *P.M. Peterson & J.M. Saarela 22045* (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989,

oak forest, 1930 m, *P.M. Peterson, Annable & Y. Herrera 8024* (ENCB, US); **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, *P.M. Peterson 20034, F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US); 9.5 mi E of Guadalupe y Calvo on hwy 24, 14 Sep 2006, 2570 m, *P.M. Peterson 20059, F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Guerrero:** 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable 5850* (ENCB, US); 10 mi E of Tomochic, 13 Oct 1984, 2300 m, *Spellenberg & M. Spellenberg 7891* (NMC). **Madera:** proximidad a la Col. Chuichupa, 1 Nov 1990, pastizal & bosque [pastureland and trees] de *Juniperus deppeana*, 2240 m, *A. Benítez 2184* (CIIDIR, ENCB); Laguna de Babicora, Arroyo El Jaral, 10 Sep 1994, 2300 m, *G. Quintana & E. Estrada 3577* (NMC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” in the barranca [canyon] at the base of the falls, 11 Nov 1989, 1600 m, *M. Mahrt & Spellenberg 82* (NMC); Parque Nal. Cascada basaseachic, por los estacionamientos [parking lots], 22 Sep 1994, *R. Corral, Spellenberg & E. Estrada RCD5452* (UACJ); Near Mirador of Cascada Basaseachic, 2022 m, slopes with *Pinus*, 7 Sep 2008, *P.M. Peterson & J.M. Saarela 22091* (US). **Riva Palacio:** 11.3 km W of Nuevo Majalca, 25.7 km W of hwy 45, N of Chihuahua, 22 Sep 1988, pine woods, 1800 m, *P.M. Peterson & Annable 5779* (ENCB, US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7946b, 7957, 7968* (ENCB, US).

**214. *Muhlenbergia ciliata*** (Kunth) Trin., Gram. Unifl. Sesquifl. 193, t. 5, f. 16. 1824. *Muhlenbergia ciliata* (Kunth) Kunth, Révis. Gramin. 1: 63. 1829.

Delicate annual plants. Culms (7)10–30 cm tall, slender, loose, glabrous, often branched from the inferior nodes. Sheaths 1.5–5 cm long, rounded, glabrous or sparsely pilose; ligules 0.3–0.9 mm long, membranous pilose and/or erose; blades 1.5–4 cm long, 1–1.5(2) mm wide, folded or involute, glabrous to scattered pilose, often reflexed or spreading. Panicles 4–12 cm long, 1.8–5 cm wide; branches (1)1.5–2 cm long, some distant, widely spreading or reflexed, spikelet-bearing to the base. Spikelets 2–2.5 mm long, appressed to the branches and overlapping; glumes subequal, glabrous, acuminate or shortly awned, lower glumes 0.7–1.5 mm long, upper glumes 1–1.8 mm long; lemma 2–2.2(2.5) mm long, lanceolate, 3-veined, often appearing 5-veined, lateral veins ciliate to the apex, rarely only scabrous, the awn 5–7(10) mm long; palea 1.6–2.4 mm long, narrowly lanceolate; anthers 0.3–0.5 mm long, yellowish changing to pale with age. Caryopsis 0.8–1.8 mm long, narrowly fusiform, brown-reddish.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia ciliata* grows in xerophilous scrub and pine or oak forests at elevations of 1,880–2,400 m. This species is widely distributed in Mexico, Central America, and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 14.8 mi NE of El Vergel, 2100 m, *P.M. Peterson &*

*Annable 4080* (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna 10722* (US). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V. 51* (MEXU). **Chinipas:** Sierra Milpillas, 24.1 mi E of Los Tanques on road to Milpillas, 2100 m, *P.M. Peterson & Annable 4179* (US); 3.4 mi W of Sagarivito on road to Chinacas, 10 Sep 2008, rocky slopes with *Acacia*, *Opuntia*, *Quercus*, 1617 m, *P.M. Peterson & J.M. Saarela 22172* (US). **Guachochi:** 28.3 km S of Cusarare on road to Guachochi, entering Barranca del Cobre, 1900 m, *P.M. Peterson & Annable 5901* (US); 24.3 mi S of Creel on road to Batopilas at Barranca del Cobre, 1930 m, *P.M. Peterson, Annable & Y. Herrera 8017* (US); 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufo, 2000 m, *P.M. Peterson, Annable & Y. Herrera 8047* (US); 20.3 km NE of La Bufo and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna 10809* (US); 11.3 km NE of La Bufo and 2.1 km S of Kirare, 1950 m, *P.M. Peterson, Annable & Valdés-Reyna 10821* (US); 9 mi S of Guachochi at Barranca Río Green, 2470 m, *P.M. Peterson & J. Cayouette 15376* (US). **Guerrero:** Arroyo Ancho, Sierra Madre, Sep 1887, *C.G. Pringle 1435* (US); 4.5 mi W of Tomóchic on Hwy 16, 2200 m, *P.M. Peterson & Annable 4541* (ENCB, US). Estación Coru, 1900 m, *C.G. Pringle 13245?* (MEXU); Tomóchic, 2 km alrededor del poblado [around the village], 2100 m, *M. Vergara 157* (MEXU). **Ocampo:** Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable 12528* (US).

215. *Muhlenbergia crispiseta* Hitchc., *N. Amer. Fl.* 17(6): 440. 1935.

FIGURE 156A–D

Caespitose annual. Culms 7–16 cm tall, erect, very branched in the inferior nodes. Sheaths glabrous, the inferior overlapped; ligules 1.3–2 mm long, membranous, rounded at the apex; blades 1–5 cm long, 0.7–1.4 mm wide, flat to involute, pubescent to glabrous. Panicles 1.8–4.5 cm long, largely exserted, branches 1.5–2.8 cm long, ascending, flowered from base, pedicels 0.5–2 mm long, often curved; glumes 1.2–1.8 mm long, pale, unequal, glabrous, lower glume 1.2–1.6 mm long, apex acute, 1-veined, upper glume 1.6–1.8 mm long, wider, oblong, 3-veined, apex truncate, 3-toothed; lemma 1.7–2.2 mm long, cylindrical, lanceolate, densely pilose on the proximal ½, glabrous over the rest, apex 2-toothed, lemma awn 8–18 mm long, slender, sinuose-undulate or crisped and flexuous, green-olive; palea 1.1–1.7 mm long, lanceolate, sparsely pilose between the veins in the proximal ½, apex acuminate; anthers 0.4–0.7 mm long, reddish-purple. Caryopsis 0.5–1 mm long, ellipsoid, brown.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia crispiseta* grows in oak or pine forests at elevations of 1,880–2,680 m. It ranges from the United States to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 12.1 mi NE of El Vergel on Hwy 24, SW of Parral, 2000 m, *P.M. Peterson & Annable 4063* (US); 10.9 mi NE of El Vergel on Hwy 24, SW of Parral, 2000 m, *P.M. Peterson & Annable 4067* (US); 56.4 km W of Parral on road to Balleza and 35.5 km

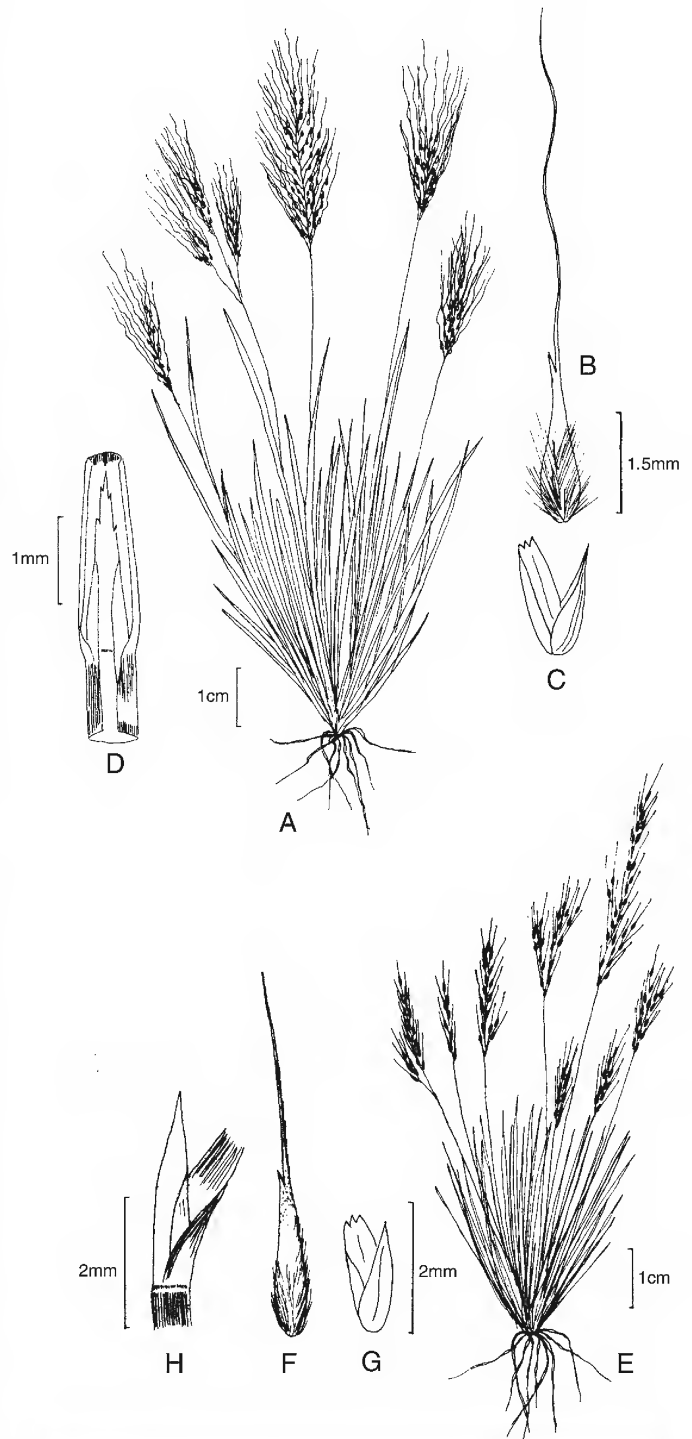


FIGURE 156. *Muhlenbergia crispiseta*. A. Habit. B. Floret. C. Glumes. D. Ligule. *Muhlenbergia peruviana*. E. Habit. F. floret. G. Glumes. H. Ligule. Drawn by Midge Gillette for PMP.



S of Balleza, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10721 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2280 m, *P.M. Peterson, Annable & Valdés-Reyna* 10768 (US); 45 mi W of Balleza on road towards Guachochi, 2560 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13551 (US). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab* V. 42 (MEXU). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7663b (US). **Cusihuiiriáchi:** SW of town Cusihuiiriáchi on the top of La Bufa, 18 air km S of Cuauhtémoc, 2400 m, *Spellenberg & D. Jewell s.n.* (MEXU). **Chihuahua:** 39 km carr. [hwy] Chihuahua–Namiquipa, 2300 m, *M. Vergara* 182 (MEXU); Mapula Mts, *C.G. Pringle* 824 (US). **Guachochi:** 16 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *Y. Herrera, P.M. Peterson & Annable* 978 (CHAPA); 18 mi E of Guachochi on Mex 127 towards Balleza, 2600 m, *Y. Herrera, P.M. Peterson & Annable* 977 (CHAPA); 11 km al SW de Cuasarare, 2400 m, *P.M. Peterson & Annable* 5892 (US); 19.3 km E of Guachochi, 2300 m, *P.M. Peterson & Annable* 5927 (US); 18 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *P.M. Peterson, Annable & Y. Herrera* 8080 (US); Parque Nacional Barranca del Cobre, 12 mi SE of Samachique on road towards Guachochi, 2150 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13588 (US). **Guerrero:** 18.7 mi N of San Juanito on road to Creel, 2335 m, *Y. Herrera, P.M. Peterson & Annable* 957 (CHAPA); 35.4 km SW of La Junta and 74 km N of Creel, 2200 m, *P.M. Peterson & Annable* 5834 (US); 29 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 2200 m, *P.M. Peterson & R.M. King* 8197 (US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8216 (US); Sierra Madre, porphyry ledges near Guerrero, 2200 m, Aug 1887, *C.G. Pringle* 1411 (MEXU, US); 23.6 mi W of Hwy jct at La Junta on road to Tomóchic, 18 mi E of Tomóchic, 2200 m, *P.M. Peterson & Annable* 4534 (US). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 3 Oct 1989, 1910 m, *P.M. Peterson & R.M. King* 8265 (US); 19.3 km S of Villa Matamoros on Hwy 45 to Dgo., 1800 m, *P.M. Peterson & Annable* 5974 (US). **Ocampo:** Cascada de Basaseachic, 37 mi W Tomochic, 2200 m, *P.M. Peterson & Annable* 4546 (US); Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable* 12527 (US). **Parral:** 24.9 km SE of Balleza, 22.5 km N of hwy 24, W of Parral, 1900 m, *P.M. Peterson & Annable* 5950 (US). **Riva Palacio:** Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *P.M. Peterson & Annable* 4528 (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *P.M. Peterson & Annable* 5791 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12558 (US). **Uruáchi:** 17.6 mi E of Maycoba on hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable* 12517 (US).

**216. *Muhlenbergia decumbens*** Swallen, Bol. Soc. Bot. México 23: 30–32, f. 4. 1959. *Chaboissaea decumbens* (Swallen) J. & C. Reeder, Phytologia 65(2): 156. 1988.

Annual; delicate. Culms 12–30 cm tall, decumbent, branched and rooting at the lower nodes. Sheaths  $\frac{1}{2}$  the length of internodes,

glabrous with hyaline margins; ligules 1.6–2.5 mm long, hyaline, entire, the apex truncate; blades 2.5–8 cm long, 0.8–1.4 mm wide, flat, scaberulous, margins scabrous to the apex. Panicles (4)8–11 cm long, 1.5–4.5 cm wide, narrow, branches 2.5–4.8 cm long, ascending; pedicels 1–3 mm long, rigid, scabrous. Spikelets 3–3.8 mm long, 1- or 2-flowered, erect, plumbeous; glumes 1.8–3.2 mm long, subequal, grayish, glabrous and scabrous on midveins, apex acuminate to mucronate, the mucro 0.6 mm long, lower glume 1.8–2.5 mm long, upper glume 2.4–3.2 mm long, wider than lower; lemma 3–3.8 mm long, lanceolate, compressed-keeled toward the apex, awned or awnless, appressed-pubescent on margins on the lower  $\frac{1}{3}$ , dark green to gray with light greenish-white spots, apex long acuminate, the awns 0.2–3 mm long; palea similar to the lemma, veins extended into small mucros 0.3–0.6 mm long; anthers 0.9–1.1 mm long, greenish. Caryopsis 2–2.3 mm long, fusiform, brown.  $n = 16$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia decumbens* is endemic to Chihuahua and grows in sandy clay loam to dark clay soils along sloughs and wet depressions in pine-oak–juniper woodlands (Peterson and Annable, 1992).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes:** W of Casas Grandes, 5 mi S of Hernández, 18 Sep 1960, pine-oak region, 2100 m, *Reeder, C. Reeder & Soderstrom* 3510 (NMC, US). **Cuauhtémoc:** km 31 between Cuauhtémoc & V. Guerrero, 27 Oct 1954, *Hern.-Xol. & C. Tapia* N-359 (US), holotype; 21 km W of Chauhtemoc on Hwy 16, 23 Aug 1990, *P.M. Peterson* 9587 (US); 12.8 mi W of Cuauhtémoc on Mex 16, 9 Sep 1989, wet meadow in dark mud, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 952 (CIIDIR, ENCB); *P.M. Peterson & Annable* 5820 (MEXU, US); about 11 mi W of Cuauhtémoc, 5 Oct 1966, 7600 ft, *Reeder & C. Reeder* 4593, 4599, 4601 (ENCB, MEXU, US); 4848 (US); 14.3 mi W of Cuauhtémoc on hwy 16, 21 Sep 1986, 2200 m, *P.M. Peterson & Annable* 4533 (ENCB, MEXU, NMC, US). **Guerrero:** 32 km SW of La Junta on road to Creel, 7 Sep 1989, flat open woods with *Quercus*, *Pinus*, *Juniperus*, 2310 m, *P.M. Peterson, Annable & Y. Herrera* 7983 (MEXU, US). **Madera:** 5 mi N of Long at the edge of a small lake in oak-pine zone, 12 Oct 1953, 2375 m, *Reeder & C. Reeder* 2683 (CIIDIR, ENCB).

**217. *Muhlenbergia depauperata*** Scribn., Bot. Gaz. 9: 187, f. 1–2. 1884.

FIGURE 157

Caespitose annual. Culms 3–15 cm tall; internodes mostly scaberulous or pubescent, pubescent or strigose below the nodes, very branched at the lower nodes. Sheaths often longer than the internodes, somewhat inflated, smooth or scabrous, keeled, margins scarious; ligules 1.4–2.5 mm long, membranous, acute, with lateral lobes; blades 1–3 cm long, 0.6–1.5 mm wide, flat or involute, scabrous to strigose, midveins and margins thickened, whitish. Panicles 2.5–8.5 cm long, 0.5–0.7 cm wide, contracted; primary branches 1–2.2 cm long, appressed, spikelet-bearing to the base, spikelets borne in subsessile-pedicellate pairs; longer

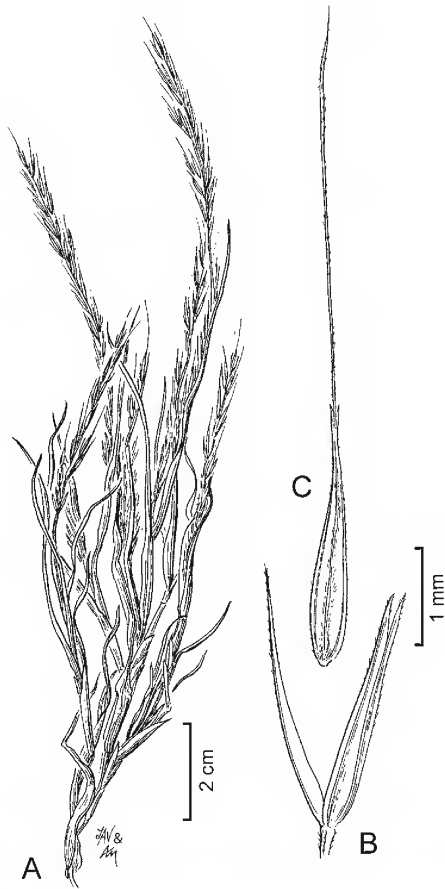


FIGURE 157. *Muhlenbergia depauperata*. A. Habit. B. Glumes. C. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

pedicels 3–6 mm long, scabrous; disarticulation beneath the spikelet pairs at the base of pedicel. Spikelets 2.5–4.5 mm long, appressed; glumes 2.3–5.1 mm long, equaling or exceeding the florets; lower glumes 2.3–4 mm long, subulate, 2-veined, minutely to deeply bifid, teeth awnless or with awns to 1.3 mm long; upper glumes 3–5.1 mm long, lanceolate, 1-veined, entire, acuminate; lemmas 2.5–4.5 mm long, narrowly lanceolate, light greenish-brown to purplish, scabrous, appressed-pubescent on the margins and midveins, apex acuminate, awned, the awns 6–15 mm long, stiff; paleas 2.4–3.6 mm long, lanceolate, intercostal region appressed-pubescent, apex acuminate; anthers 0.5–0.8 mm long, purplish to yellowish. Caryopsis 1.5–2.3 mm long, narrowly fusiform, brownish.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia depauperata* grows in gravelly flats, rock outcrops, exposed bedrock, sandy banks, and grama grassland associations, usually on soils derived from calcareous parent materials, and associated with species of *Selaginella*, *Hechtia*, *Opuntia*, *Salvia*,

and *Juniperus* at 1,530–2,400 m. Its range extends into the southwestern United States, and in Mexico this species occurs in Aguascalientes, Chihuahua, Distrito Federal, Durango, Guanajuato, Jalisco, México, Oaxaca, Puebla, San Luis Potosí, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Jiménez:** Presón del Apache, upper part of Canyon del Apache, SE quadrant of Sierra del Diablón, 1650 m, F. Chiang, T. Wendt & M.C. Johnston 9028 (MEXU); Sta. Eulalia Mts, C.G. Pringle 404 (US). **Matamoros:** Just N of Villa Matamoros on Hwy 45 towards Parral, 1700 m, P.M. Peterson & Annable 4082, 4579 (ENCB, US); 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, P.M. Peterson & Annable 4082, 4083 (ENCB, US); Reeder & C. Reeder 4623, 4885 (ENCB, US); 19.3 km S of Villa Matamoros on Hwy 45 to Dgo., 1800 m, P.M. Peterson & Annable 5977, 10863 (US). **Ocampo:** Parque Nacional Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, Tenorio & R. Torres 4511-a (IBUG).

218. *Muhlenbergia distichophylla* (J. Presl) Kunth, Enum. Pl. 1: 202. 1833.

Caespitose perennial. Culms 100–180 cm tall, erect, glabrous to pubescent below the nodes; internodes glabrous. Sheaths 8–42 cm long, longer than basal internodes, glabrous, the keels prominent, sometimes coiled to shredded below, basal sheaths compressed-keeled; sheath auricles 0.4–2.6 cm long, on lower portions and to 6.4 cm above; ligules 4–15 mm long, membranous, apex finely lacerate sometimes almost to the base; blades 18–90 cm long, 2–7 mm wide, flat or folded, scaberulous to scabrous in both sides, the margins and keel saw-toothed. Panicles 35–70 cm long, 4–15 cm wide, densely flowered, oblong, sometimes lax near apex, greenish-brown, sometimes reddish-purple; primary branches 2–15 cm long, without spikelets near the base, appressed to loosely spreading up to 60° from the rachises; pedicels 0.2–4 mm long, glabrous to scaberulous. Spikelets 1.5–2.8(3) mm long, erect, greenish-brown, to reddish-purple; glumes 1.2–2.8 mm long, longer, as long as, or a little shorter than the lemma, subequal, oblong to narrowly oblong, faintly 1-veined, hyaline, glabrous to scaberulous, usually with faint, widely scattered hairs, the hairs less than 0.1 mm long, apex acute to acuminate; upper glumes rarely mucronate, the mucro to 0.4 mm; lemmas 1.4–2.7 mm long, lanceolate to linear-lanceolate, awned, glabrous or sometimes the margins on the lower 1/3 pubescent, the hairs to 0.2 mm long, rarely the lower 1/3 with scattered hairs, callus usually short pilose, apex acute, minutely bifid, the teeth to 0.5 mm long, the awn 4–16 mm long, flexuous, often reddish-purple near base; paleas 1.3–2.7 mm long, glabrous or with few hairs between the veins on the lower 1/3, apex acute; anthers 1.2–1.5 mm long, yellowish, sometimes reddish tinged.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia distichophylla* occurs from central Mexico in Chiapas, Guerrero, Jalisco, México, and Oaxaca to Guatemala; found in open pine-oak forests and tropical deciduous forests on rocky slopes, canyons, and ravines, with *Pinus* spp. and *Quercus* spp. at 400–2,000 m.

SPECIMENS EXAMINED. MEXICO. Chihuahua. **Chinipas:** 1 mi E of Sagarivito, 10 Sep 2008, small arroyo with oaks and pines, 1490 m, *P.M. Peterson & J.M. Saarela* 22160 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13564 (US); Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, *P.M. Peterson & M.B. Knowles* 13583 (US).

219. *Muhlenbergia diversiglumis* Trin., Mém. Acad. Imp. Sci. St.-Petersbourg. Ser. 6, Sci. Math., Seconde Pt. Sci. Nat. 6, 4(3-4): 298. 1841.

FIGURE 158A-D

Delicate, sprawling annual. Culms 20–50(70) cm tall, glabrous and glossy, inferior nodes retrorse-pilose, rooting at the lower nodes. Sheaths papillose-pilose to glabrous, the hairs up

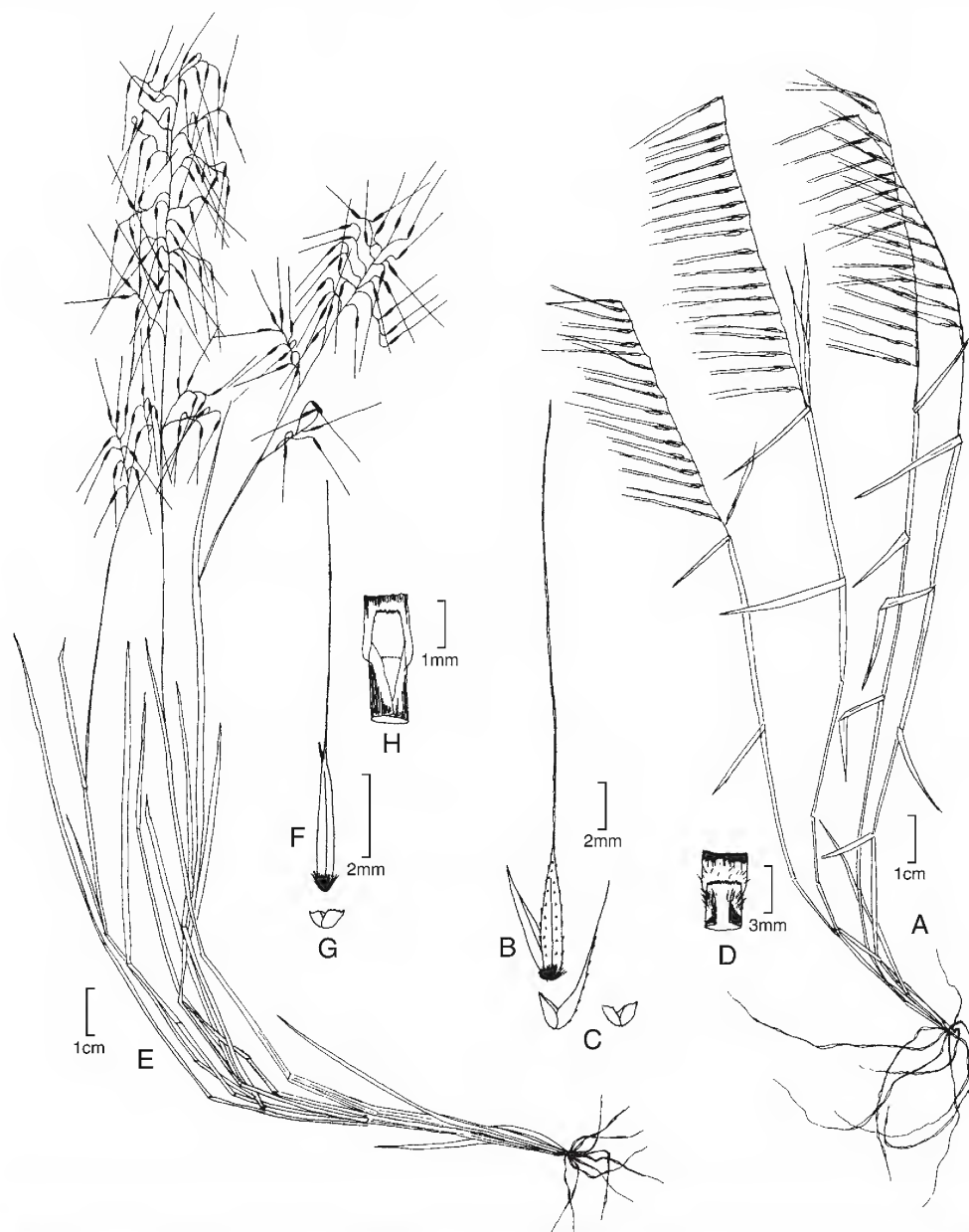


FIGURE 158. *Muhlenbergia diversiglumis*. A. Habit. B. Floret. C. Glumes. D. Ligule. *Muhlenbergia implicata*. E. Habit. F. Floret. G. Glumes. H. Ligule. Drawn by Midge Gillete for PMP.

to 3 mm long; ligules 0.5–1 mm long, apex erose; blades 1.5–4(6) cm long, 1–1.5(2) mm wide, flat or loosely involute, glabrous, papillose-pilose near the base and margins. Panicle 4–10(15) cm long, 2–4.5 cm wide, pale green or sometimes purple; branches 10–20 cm long, 1–2 cm wide, spreading at right angles to the culm and reflexed or secund, disarticulating at the base with spikelets appressed and falling as a unit. Spikelets dimorphic, 2–5 on each branch, pedicels 1–5 mm long, scabrous or short papillose-pilose; glumes 0.2–8 mm long, dimorphic; proximal spikelets of each branch 0.2–0.7 mm long, orbicular, apex irregularly toothed to erose, subequal; distal spikelets the glumes unequal; lower glumes 5–8 mm long, ovate, apiculate, awned, the awn 1–2.5(7) mm long; upper glumes 0.2–0.7 mm long, orbicular, apiculate, occasionally awned; lemma 4–7.5 mm long, glabrous to papillose-scabrous with 3 prominent usually greenish veins, apex awned, the awn of 5–19 mm long; palea 3.7–6.8 mm long, attenuate, the veins prominent, sometimes 2-toothed, scabrous between the veins; anthers 0.4–0.8 mm long, yellowish. Caryopsis 1.8–3 mm long, oblong-ovoid, flattened, brown.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia diversiglumis* occurs in pine or oak forests at elevations of 1,700–2,000 m. It ranges from Mexico to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Sierra Charuco, Río Fuerte, 1700 m, *Gentry* 1761 (CHAPA). **Chinipas:** Sierra Milpillas, 24.1 mi E of Los Tanques on road to Milpillas, 2100 m, *P.M. Peterson & Annable* 4178 (US). **Guachochi:** 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufa, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 8046 (US); Parque Nacional Barranca del Cobre, 11.3 km NE of La Bufa and 2.1 km S of Kirare, 1950 m, *P.M. Peterson, Annable & Valdés-Reyna* 10819 (US). **Uruáchi:** 1.7 mi W of Maycoba on Hwy 16 towards Yécora, 1720 m, *P.M. Peterson & J. Cayouette* 15352 (US).

220. *Muhlenbergia dubia* E. Fourn., *Biol. Cent.-Amer., Bot.* 3(29): 540. 1885.

FIGURE 159F-I

Densely caespitose perennial. Culms 30–100 cm tall, erect, not rooting at the lower nodes; internodes glabrous, minutely pubescent to hirtellous below the nodes. Leaf sheaths longer than the internodes, smooth or scaberulous, rounded basally; ligules 4–10 mm long, membranous, firm below, acute, lacerate, brownish; blades 10–60 cm long, 1–2 mm wide, usually involute (occasionally flat), scabrous abaxially, hirsute adaxially. Panicles 10–40 cm long, (0.6)1–2.4 cm wide, contracted, grayish-green; primary branches 0.6–7 cm long, diverging to 40° from the rachises, stiff, spikelet-bearing to the base; pedicels 0.1–6 mm long, strongly divergent, hirsute. Spikelets 3.8–5 mm long, grayish-green; glumes (1.8)2–3 mm long, equal, shorter than the florets, glabrous and smooth proximally, scaberulous distally, faintly 1-veined, acute; lemmas 3.8–5 mm long, narrowly lanceolate, calluses hairy, hairs to 0.5 mm long, lemma bodies glabrous and smooth below, scabrous distally, apex acuminate, awnless, mucronate or awned, the awns 1–6 mm long, straight; paleas 3.8–5 mm long, narrowly lanceolate, glabrous below, acuminate;

anthers 1.5–2.2 mm long, greenish. Caryopsis 2.5–3.5 mm long, fusiform, brownish.  $2n = 40, 50$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia dubia* grows on steep slopes, ridge tops, limestone rock outcrops, and along draws with *Juniperus flaccida*, *Quercus* spp., and *Pinus ponderosa* at 1,500–3,200 m. Its range extends from western Texas and southern New Mexico to Mexico, where this species occurs in Aguascalientes, Chihuahua, Durango, Distrito Federal, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tlaxcala, Veracruz, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tah V.* 63 (MEXU); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 10 Sep 1989, 2330 m, *P.M. Peterson, Annable & Y. Herrera* 8028 (US). **Chihuahua:** Hills near Chihuahua, 1800 m, *C.G. Pringle* 403 (US); 12 mi N of Chihuahua, 1800 m, *Soderstrom* 931 (US). **Cuahtémoc:** 12 mi W of Cuahtémoc, 2128 m, *Reeder & C. Reeder* 4857 (ENCB). **Guachochi:** Parque Nacional Barranca del Cobre, 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna* 10804 (US); Entering Barranca El Cobre, approx. 25.7 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5897 (US); 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, *M.E. Siqueiros* 1640 (MEXU); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13565 (US); 30.2 km N of San Juanito on road to Creel, 10 Sep 1989, 2235 m, *P.M. Peterson, Annable & Y. Herrera* 8001 (US). **Guerrero:** Km 96 Yeporema–San José Babicora, al N de Vicente Guerrero, 2100 m, *Hern.-Xol. & C. Tapia* N-455 (CHAPA). **Hidalgo del Parral:** Minas Nuevas, 8 mi NW of Parral, 1829 m, *Correll* 22736 (US). **Ignacio Zaragoza:** 72.5 km S of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2300 m, *P.M. Peterson & R.M. King* 8175 (US). **Madera:** Guayanopa Canyon, Sierra Madre, Sep 1903, *M.E. Jones s.n.* (US) Type frag. **Riva Palacio:** Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 23 Sep 1988, 2100 m, *P.M. Peterson & Annable* 5808 (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 23 Sep 1988, 2200 m, *P.M. Peterson & Annable* 5809 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7937 (US).

221. *Muhlenbergia dumosa* Scribn. ex Vasey, *Contr. U.S. Natl. Herb.* 3(1): 71. 1892.

FIGURE 160

Densely caespitose perennial; rhizomes elongated. Culms 50–150(300) cm tall, bamboo-like, woody at base, emerging from a scaly rhizome 2–5 mm in diameter, freely branched at superior and central nodes, pubescent to glabrous below the nodes, branches fastigiated and numerous, central culm and proximal branches covered with sheaths until growth. Sheaths glabrous; ligules 0.3–0.5 mm long, truncate, erose; blades 2–5(10) cm long, 0.5–1.5 mm wide, flat or finely involute, articulate at the base and deciduous at the sheath apex. Panicles 1–3(4) cm long,

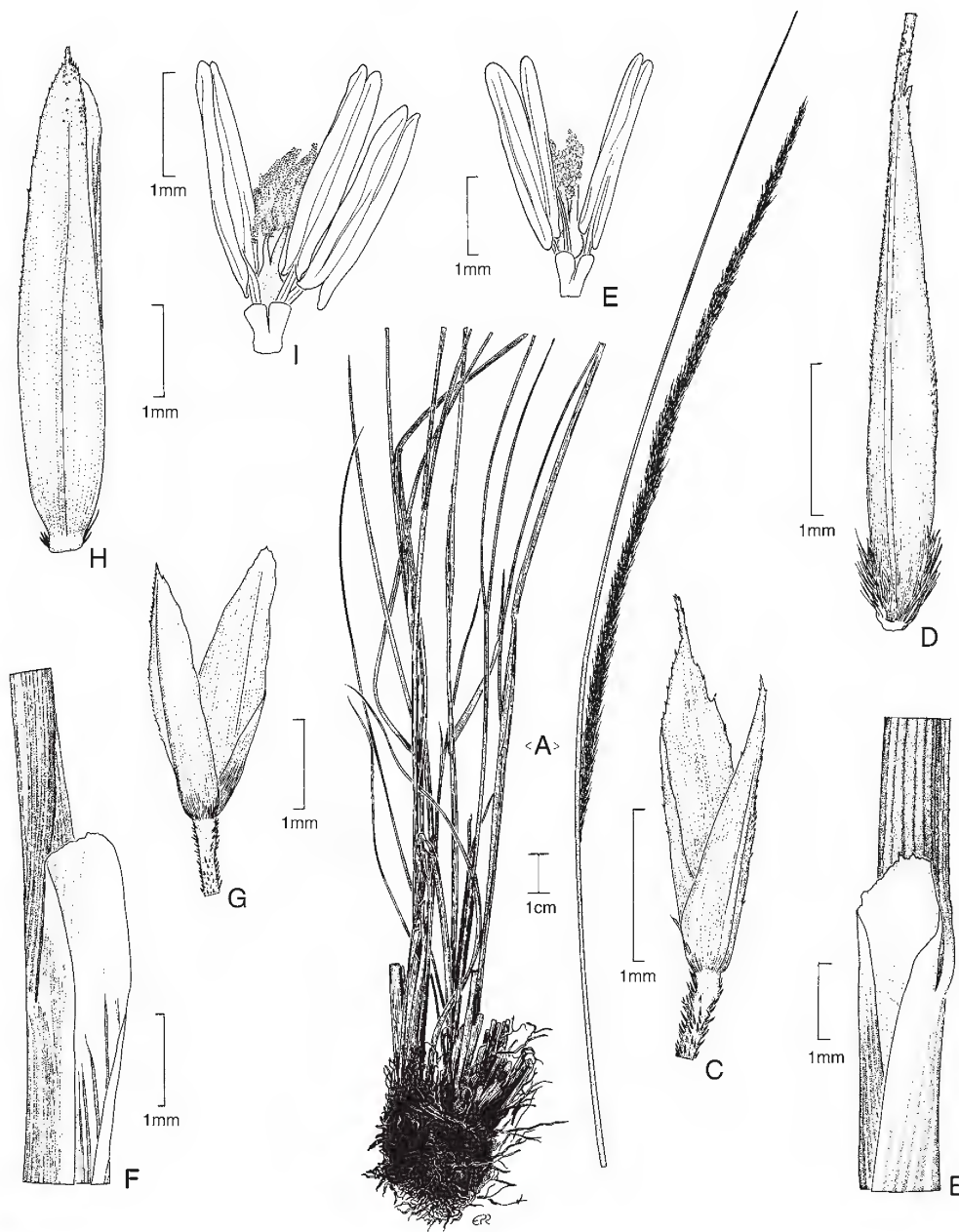


FIGURE 159. *Muhlenbergia palmeri*. A. Habit. B. Ligule. C. Glumes. D. Floret. E. Lodicules, pistil, and stamens. *Muhlenbergia dubia*. F. Ligule. G. Glumes. H. Floret. I. Lodicules, pistil, and stamens. Drawn by Elisabeth P. Roberts for Smithsonian Institution, Department of Botany.

0.3–1.3 cm wide, numerous and flexuous, pedicels 0.1–1.5 mm long. Spikelets 2.2–3.1 mm long, greenish or purplish; glumes 1–1.7 mm long, shorter than spikelet, subequal, 1-veined, persistent; lower glumes 1–1.3 mm long, mucronate, the mucro 0.5–1 mm long; upper glumes 1.3–1.7 mm long, mucronate or awned,

the awn 0.6–2 mm long; lemma 2–2.2 mm long, membranous, pale or occasionally purplish, glabrous with green veins, awned, the awn (3)5–11 mm long; palea 2–2.2 mm long, similar to lemma; anthers 1.2–2 mm long, purple. Caryopsis 1.2–1.6 mm long, fusiform, reddish-brown.  $2n = 40$ .





FIGURE 160. *Muhlenbergia dumosa*. A. Habit. B. Culm and inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia dumosa* grows in pine-oak forests and tropical forests at elevations of 1,700–2,100 m. It ranges from the southwestern United States to Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 69.2 km al E de Guachochi and 25.7 km W of Balleza, 26 Sep 1988, 2100 m, P.M. Peterson & Annable 5942 (US); 11 mi SE of Balleza on road to Parral, 1800 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13526 (US). **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, 1700 m, Gentry 8034 (MEXU, US). **Guachochi:** Parque Nacional Barranca del Cobre, 0.5 km E of La Bufa at the bridge crossing the Río Batopilas, 1000 m, P.M. Peterson, Annable & Valdés-Reyna 10837 (US); West of Munérachi, 1200 m, P.M. Peterson & P. Catalán 17718 (US).

222. *Muhlenbergia elongata* Scribn. ex Beal, Grass. N. Amer. 2: 251. 1896.

FIGURE 161E-H

Caespitose perennial; never rhizomatous. Culms 40–120 cm tall, erect, not branched, glabrous, sometimes scabrous below the nodes. Sheaths glabrous to scabrous, rounded to base; ligules 2–8 mm long, firm below, membranous to the apex, apex obtuse or acute; blades 15–50 cm long, 0.5–1.5 mm wide, flat to involute, glabrous to scabrous. Panicles 15–50 cm long, 1–7 cm wide, loosely contracted not dense, branches 1–8 cm long, appressed to barely divergent, naked basally; pedicels 1.3–8 mm long, hirsute. Spikelets 3–4.2 mm long, straw-colored at maturity; glumes 2–3 mm long, slightly shorter than the lemma, subequal, glabrous at the base, minutely pubescent to scabrous near the apex, 1-veined, apex acuminate to acute, sometimes awned, the awn 1–1.6 mm long; lemma 2.8–4.2 mm long, narrow-lanceolate, glabrous at the base, scabrous near the apex, apex acuminate, awned, the awn 10–40 mm long, straight to flexuous; palea 2.8–4.2 mm long, narrowly lanceolate, glabrous acuminate; anthers 1.4–2.2 mm long, yellow. Caryopsis 2–2.2 mm long, fusiform, brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia elongata* grows in rhyolitic conglomerate or volcanic substrates on rocky slopes and canyon walls at elevations of 1,500–2,400 m. It ranges from the United States to Mexico in Chihuahua, Hidalgo, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Hacienda San Miguel, near Batopilas, 2100 m, E. Palmer 159 (TAES, US); Batopilas, 2000 m, R. Fierros 1663 (MEXU); 14.5 km N of Batopilas on road to La Bufa, 12 Sep 1989, 1850 m, P.M. Peterson, Annable & Y. Herrera 8064 (US); S side of Urique bridge, between Humirá and Napuchic, 1500 m, Bye 6933 (TAES). **Bocoyna:** Cabecera de la cañada de Reco-goata, 2400 m, B. Tab V. 65 (MEXU). **Chinipas:** 1 mi E of Saguaro, 10 Sep 2008, small arroyo with oaks and pines, 1490 m, P.M. Peterson & J.M. Saarela 22164 (US). **Chihuahua:** 12 mi N of Chihuahua, 1800 m, Reeder, C. Reeder & Soderstrom 3484 (ENCB); Cañón del 54, 1800 m, J. Peña s.n. (ENCB); Hills near Chihuahua, 1800 m, C.G. Pringle 398 (MEXU, US), type. **Guachochi:** Parque Nacional Barranca del Cobre, 0.5 km E of La Bufa at the bridge crossing the Río Batopilas, 1000 m, P.M. Peterson, Annable & Valdés-Reyna 10839, 10843 (US); Parque Nacional Barranca del Cobre, 3.8 km NE of La Bufa and 9.6 km S of Kirare, 1240 m, P.M. Peterson, Annable & Valdés-Reyna 10833 (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, P.M. Peterson, Annable & Y. Herrera 8026 (US); 24.6 km S of Mex 127 and 11.1 km NE of La Bufa, 11 Sep 1989, 2000 m, P.M. Peterson, Annable & Y. Herrera 8049 (US); 8.9 km NE of La Bufa on road to Creel, 1780 m, P.M. Peterson, Annable & Y. Herrera 8067 (US). **Hidalgo del Parral:** NE edge of Parral, 2200 m, I.W. Knobloch 745 (TAES); Just S of Parral, 1950 m, Soderstrom 834 (US). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, Reeder & C. Reeder 4625, 4886 (ENCB, US). **Ocampo:**

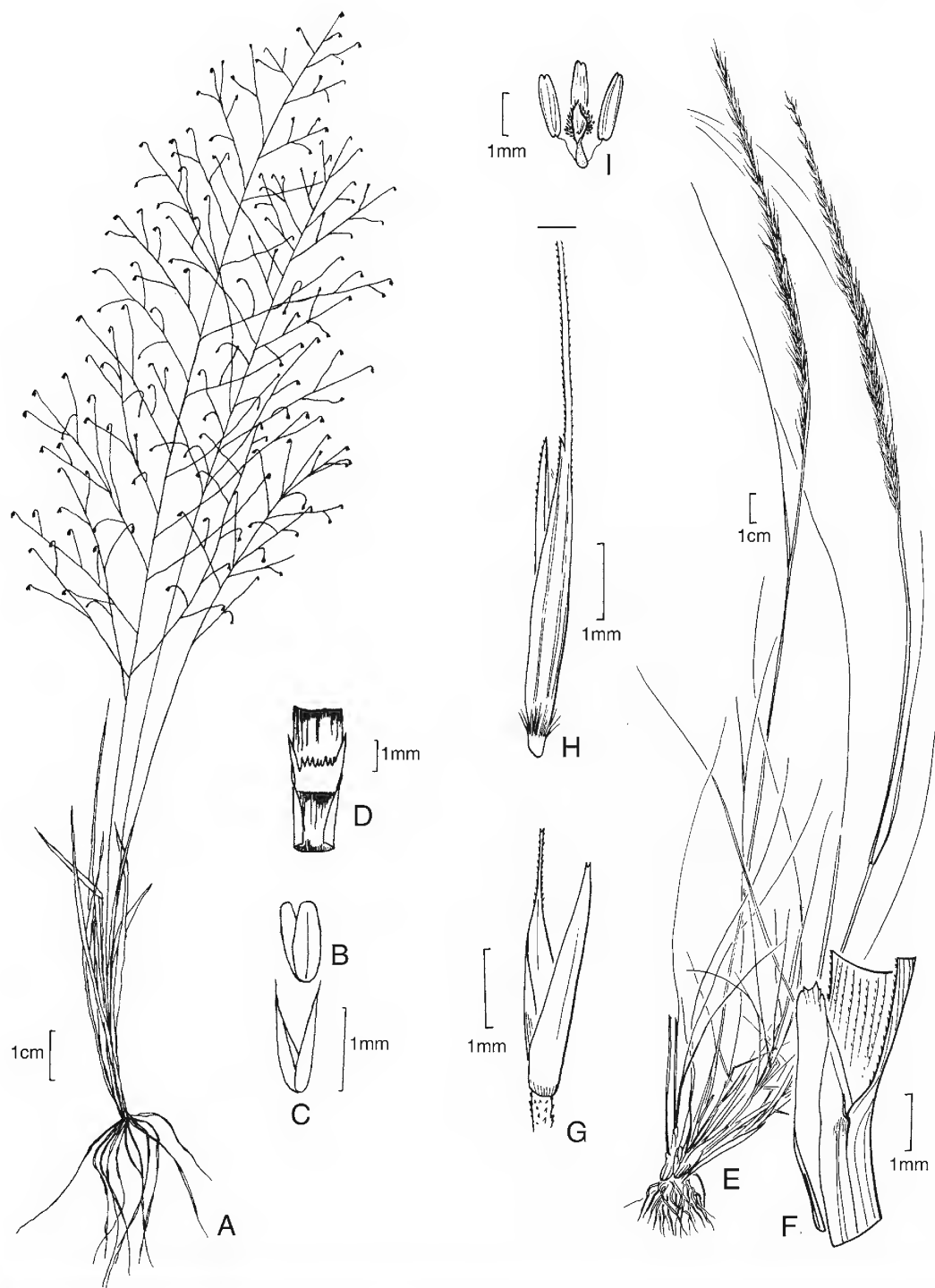


FIGURE 161. *Muhlenbergia majalcensis*. A. Habit. B. Floret. C. Glumes. D. Ligule. *Muhlenbergia elongata*. E. Habit. F. Ligule. G. Glumes. H. Floret. Drawn by Midge Gillete for PMP (A–D) and Susan C. Escher for Smithsonian Institution, Department of Botany (E–H).

122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8241, 8243 (US); Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12531 (US). **Riva Palacio:** 11.3 km W of Nuevo Majalca, 25.7 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1800 m, *P.M. Peterson & Annable* 5778 (US); Nuevo Majalca, approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P.M. Peterson & Annable* 5762 (US); Nuevo Majalca, 11.6 km W of Mex 45 on road to Parque Nacional Cumbres de Majalca, 9 Sep 1989, 1750 m, *P.M. Peterson, Annable & Y. Herrera* 7982 (US).

223. *Muhlenbergia eludens* C. Reeder, J. Wash. Acad. Sci. 39: 365–366, f. 1B. 1949.

Caespitose annual. Culms 10–40 cm tall, erect, strigulose below the nodes, internodes glabrous. Sheaths scabrous to puberulent, keeled, margins brown-yellowish; ligules 1.5–2.5 mm long, membranous, acute, lacerate to erose; blades 2–8 cm long, 0.8–2 mm wide, involute, occasionally flat, minute-pilose to scabrous. Panicles 14–24 cm long, 3–7 cm wide, spreading, open, narrowly pyramidal; branches 2–7 cm long, narrowly spreading and ascending, 1–3 per node; pedicels 1–2(3) mm long, usually shorter than the florets, slender, appressed to branches or occasionally erect. Spikelets 1.7–2.5 mm long; glumes 1.3–1.8 mm long, subequal, 1-veined; lower glumes 1.3–1.6 mm long, acuminate to sometimes mucronate, mucros 0.5 mm long; upper glumes 1.4–1.8 mm long, acuminate, wider than the lower glume, apex acuminate; lemma 1.7–2.5 mm long, lanceolate, purple to yellowish or light brown, appressed silky-pubescent along the midvein and margins, the hairs 0.3–0.5 mm long, apex awned, the awn 1.2–3.5 mm long, delicate, emerging between 2 small teeth; paleas 1.8–2.4 mm long, oblong-elliptic, glabrous; anthers 0.4–0.6 mm long, purplish. Caryopsis 1.3–2.3 mm long, fusiform, slightly compressed dorsally, light brownish.  $n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia eludens* grows in grasslands and oak–pine forests at elevations of 1,800–2,680 m. It ranges from the United States to northern Mexico in Chihuahua, Durango, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10708 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2480 m, *P.M. Peterson, Annable & Valdés-Reyna* 10769 (US). **Bocoyna:** Norogachi, 2350 m, *E. Palmer* 3D (US). **Carichi:** Sánchez, 12 Oct 1910, 2400 m, *Hitchcock* 7664.5 (CHAPA, US). **Casas Grandes:** 2 mi S of Hernández Javales, 31 mi SW of Col. Juárez, 2200 m, *P.M. Peterson & Annable* 4038, 4040 (US). **Chihuahua:** 39 km carr. [hwy] Chihuahua–Namiquipa, 2300 m, *M. Vergara* 177 (MEXU); Hills near Chihuahua, 1800 m, *C.G. Pringle* 3052 (TAES, US); Rocky hills near Chihuahua, *C.G. Pringle* 399, 400 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12561 (US); 9.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1690 m, *P.M. Peterson & Annable* 12587 (US). **Cuauhtémoc:** 10 mi W of Cuauhtémoc on hwy 16, 2000

m, *P.M. Peterson & Annable* 4055 (US); 11 mi E of Cuauhtémoc, 21 Sep 1986, 1800 m, *P.M. Peterson & Annable* 4531 (US). **Guachochi:** 12 mi E of Guachochi, 2300 m, *P.M. Peterson & Annable* 5925 (US); 18 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *P.M. Peterson & R.M. King* 8085 (US); 5.5 mi S Cieneguita de Barranca on road towards Sorichique, 2125 m, *P.M. Peterson, P. Catalán, C. López, & G. Villegar* 7702 (US). **Guerrero:** Tomochic, 2 km alrededor del poblado [around the village], 2100 m, *M. Vergara* 153 (MEXU); Miñaca, 13 Oct 1910, *Hitchcock* 7768 (US), holotype; 24 mi SW of La Junta on road to Creel, 2200 m, *P.M. Peterson & Annable* 5851 (US); 25 mi W of La Junta on rd to Parque Nacional Cascada Basaseachic, 2200 m, *P.M. Peterson & R.M. King* 8193 (US). **Ignacio Zaragoza:** 12.6 mi NE of Ignacio Zaragoza, 2400 m, *P.M. Peterson & R.M. King* 8158 (US). **Madera:** 14.5 mi SE of Madera on Mex 16 to La Junta, 2200 m, *P.M. Peterson & R.M. King* 8176 (US). **Namiquipa:** 45 mi S of Ignacio Zaragoza, 2200 m, *P.M. Peterson & R.M. King* 8167 (US). **Ocampo:** Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *P.M. Peterson & R.M. King* 8212 (MEXU, US). **Riva Palacio:** Cumbres de Majalca, 21.5 mi W of Hwy 45, 22 Sep 1988, 2200 m, *P.M. Peterson & Annable* 4524, 5789, 5794, 5796 (MEXU, US); 0.9 km E of entrance to Parque Nacional, Col. Cumbres de Majalca, 2200 m, *P.M. Peterson & Annable* 4516 (US); 20.6 mi W of Hwy 45, 0.8 mi E of Cumbres de Majalca, 2200 m, *P.M. Peterson & Annable* 4517 (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *P.M. Peterson, Annable & Y. Herrera* 7939 (US).

224. *Muhlenbergia emersleyi* Vasey, Contr. U.S. Natl. Herb. 3(1): 66. 1892.

FIGURE 162J–M

Densely caespitose perennial. Culms (65)80–150(200) cm tall, erect, stout, not conspicuously branched; internodes smooth for most of their length, smooth or scaberulous below the nodes. Sheaths 7–35 cm long, shorter or longer than the internodes, glabrous or puberulent, basal sheaths compressed-keeled, sheath auricles missing; ligules 10–25 mm long, membranous throughout, acuminate, lacerate, slightly firmer below; blades 20–50 cm long, 2–6 mm wide, flat or folded, scabrous abaxially, smooth or scaberulous adaxially, margins coarsely scabrous. Panicles 20–45 cm long, 4–7(15) cm wide, loosely contracted to open, light purplish to light brownish; primary branches 9–17 cm long, lax, loosely appressed or diverging to 70° from the rachises, naked basally; pedicels 0.5–3 mm long, erect, smooth or scaberulous. Spikelets 2.2–3.2 mm long; glumes 2.2–3.2 mm long, longer or as long as the lemma, subequal, scaberulous to scabrous, faintly 1-veined, acute to obtuse, usually unawned, occasionally mucronate, mucro to 0.2 mm long; lemmas 2–3 mm long, oblong-elliptic, pubescent along the midvein and margins on the lower  $\frac{1}{2}$ – $\frac{3}{4}$ , apex acute, usually awned, sometimes awnless or mucronate, awns generally (1)6–15 mm long, flexuous, purplish; paleas 1.8–2.9 mm long, oblong-elliptic, acute; anthers 1.2–1.6 mm long, yellowish to purplish. Caryopsis 1.3–1.6 mm long, fusiform, reddish-brown.  $2n = 24, 26, 28, 30, 40, 42, 46, 60, 64$ .

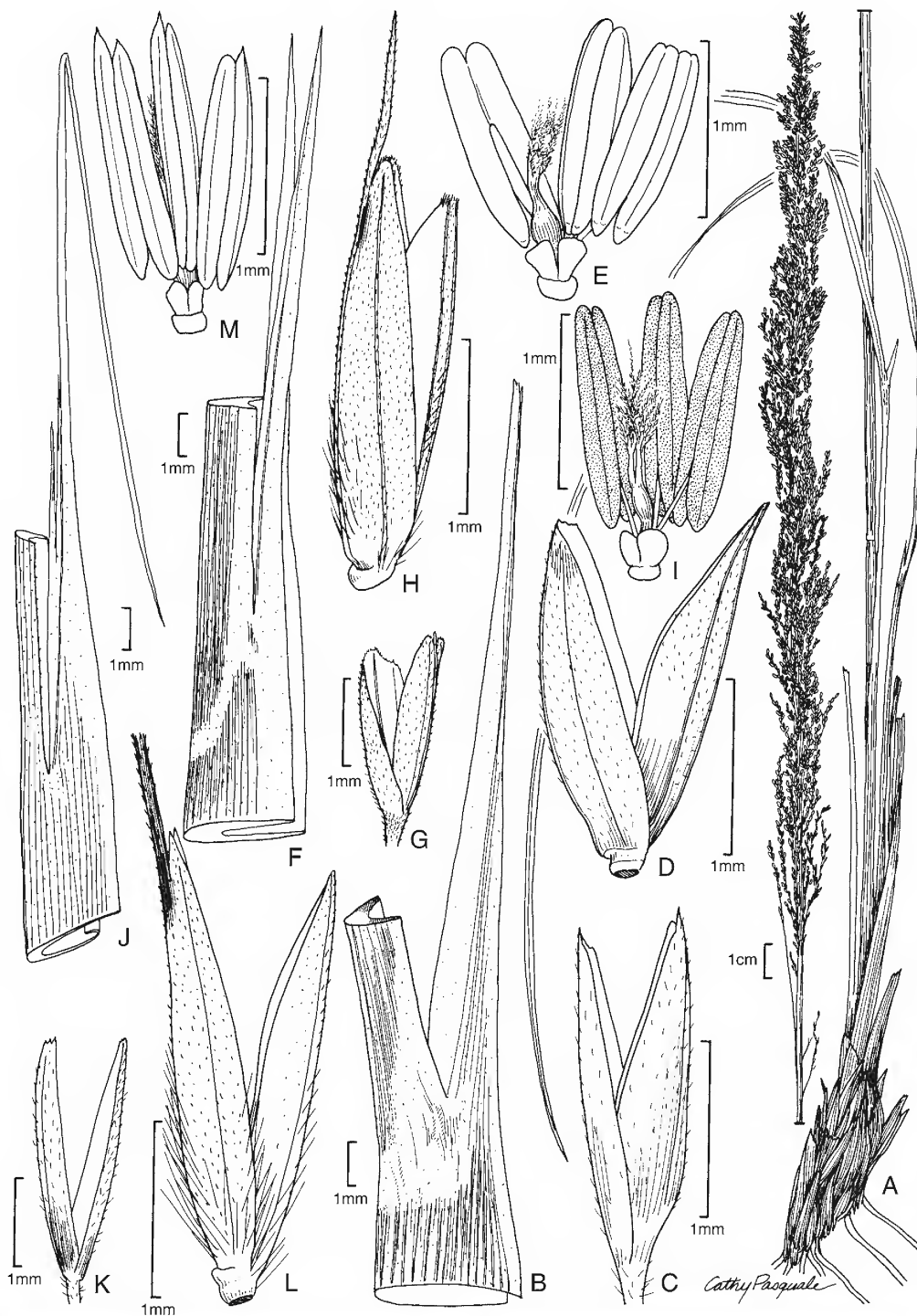


FIGURE 162. *Muhlenbergia lindheimeri*. A. Habit. B. Ligule. C. Glumes. D. Floret. E. Lodicules, pistil, and stamens. *Muhlenbergia longiligula*. F. Ligule. G. Glumes. H. Floret. I. Lodicules, pistil, and stamens. *Muhlenbergia emersleyi*. J. Ligule. K. Glumes. M. Lodicules, pistil, and stamens. Drawn by Cathy Pasquale for Smithsonian Institution, Department of Botany.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia emersleyi* grows on rocky slopes, gravelly washes, canyons, and cliffs, and along streams often derived from limestone parent material associated with oak–pinyon–juniper woodlands at 1,200–2,600 m. It occurs in western Texas, New Mexico, and Arizona and is common throughout Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 11 mi SE of Balleza on road to Parral, 1800, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton* 13516, 13517 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2280 m, *P.M. Peterson, Annable & Valdés-Reyna* 10766 (US); 19.3 km SE of Balleza towards Parral, 26 Sep 1988, 1800 m, *P.M. Peterson & Annable* 5945 (US); 16.1 km W of Balleza and 77.9 km E of Guachochi, 1990 m, *P.M. Peterson, Annable & Valdés-Reyna* 10749 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2280 m, *P.M. Peterson, Annable & Valdés-Reyna* 10765 (US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20014, 20015, 20031, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Batopilas:** Just S of Napuchis along ridgetop with *Schizachyrium* and scattered *Pinus*, 2162 m, *P.M. Peterson & P. Catalán* 17664 (US); 22 km al S de Humira, 21.8 km al SW de la desv. A La Bufa, 2070 m, *Tenorio & R. Torres* 3700 (MEXU); Brecha [gap] Samachique–Batopilas, 1400 m, *A. Rodríguez & S. Manrique* 1606 (MEXU); Between La Bufa and Quirare, on N side of Barranca Batopilas, *Bye* 5709 (MEXU). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtémoc, 5 Sep 2008, 2233 m, *P.M. Peterson & J.M. Saarela* 22024, 22035 (US); Cabecera de la cañada de Recogoata, 2400 m, *B. Tah V. 52* (MEXU). **Buenaventura:** 15 mi W of Flores Magón, 1829 m, *Reeder, C. Reeder & Soderstrom* 3499 (CHAPA, US); Hills near Buenaventura, 1950 m, *A.A. Beetle* M-7877 (MEXU). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7669, 7714, 7720 (US). **Casas Grandes:** Arroyo de Los Nogales 20 km, al S de Col. Juárez, 1450 m, *Tenorio & Romero* 1622 (ENCB, US); About 38 mi SW of Casas Grandes, 2040 m, *Reeder & C. Reeder* 2695 (ENCB); 1 mi W of Cuesta Blanca, W of Casas Grandes, 1976 m, *Reeder, C. Reeder & Soderstrom* 3349 (ENCB); W of Casas Grandes, 3 mi NE of Cuesta Blanca, 1976 m, *Reeder, C. Reeder & Soderstrom* 3449, 3542, 3543, 3548 (ENCB, US); 1 mi W of Cuesta Blanca, W of Casas Grandes, 2012 m, *Reeder & C. Reeder* 3227 (ENCB); W of Casas Grandes, 12 mi W of Col. Juárez, 1763 m, *Reeder, C. Reeder & Soderstrom* 3503 (ENCB, US); W of Casas Grandes, 5 mi S of Hernández, 2200 m, *Reeder, C. Reeder & Soderstrom* 3524 (ENCB, US); 9 mi NE of Cuesta Blanca, W of Casas Grandes, 2200 m, *Reeder, C. Reeder & Soderstrom* 3555 (ENCB); Rancho Palanganas (Mesa El Cuervo), 2020 m, *R. Fierros* 130 (MEXU); Near Casas Grandes, *C.W. Townsend* 357 (US); *Soderstrom* 734 (US); Río Piedras Green al SE del Ejido Ignacio Zaragoza, 1700 m, *Tenorio & Romero* 1695 (MEXU); W of Casas Grandes, 12 mi W of Col. Juárez, 1763 m, *Reeder & C. Reeder* 3502 (US); W of Casas Grandes, 3 mi NE of Cuesta Blanca, 1976 m, *Reeder & C. Reeder* 3548, 3549 (US); W of Casas Grandes, just S of Hernández, *Reeder & C. Reeder* 3533 (US). **Cuauhtémoc:** 10 mi W of Cuauhtémoc on Hwy 16, 5 Sep 1985, 2100 m, *P.M. Peterson & Annable* 4058 (US); 12 mi W of Cuauhtémoc, 2128 m, *Reeder &*

*C. Reeder* 3190, 4859 (ENCB); *F.W. Gould* 8946 (TAES); 11 mi E of Cuauhtémoc, 1824 m, *Reeder, C. Reeder & Soderstrom* 3467, 3469 (ENCB, US); Rancho La Estancia, 2300 m, *R. Guzmán* 4911 (MEXU); 16 mi W of Cuauhtémoc, 2300 m, *Reeder & C. Reeder* 3470, 3471, 3472 (US). **Chihuahua:** Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, *Rzedowski* 32318 (ENCB); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, *Valdés-Reyna* VR-144 (TAES); 12 mi N of Chihuahua, *Reeder & C. Reeder* 3482 (US); *Soderstrom* 930 (US); 13 mi SW of Chihuahua on road to Cuauhtémoc, *Soderstrom* 917, 918 (US); Mts. NW of Chihuahua, 1800 m, *LeSueur* 149 (US); 87.7 km N of Parral on Mex 24 towards Chihuahua, 14 Sep 1989, 1620 m, *P.M. Peterson, Annable & Y. Herrera* 8106 (US); 9.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1690 m, *P.M. Peterson & Annable* 12588 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12568 (US). **Chínipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela* 22123 (US); Sierra Milpillas, 24.1 mi E of Los Tanques on road to Milpillas, 2100 m, *A.A. Beetle, R. Alcaráz & R. Cuadra* 8054, 8114 (TAES). **Guachochi:** 5.5 mi S of Cieneguita de Barranca on road towards Sorichique, 2125 m, *P.M. Peterson, P. Catalán, C.López & G. Villegar* 17705 (US); 1–2 km south of Río Osichi and Río Basihuare jct along river bottom in rocks and slopes with *Quercus* and *Pinus*, 1600 m, *P.M. Peterson & P. Catalán* 17631 (US); Along Río Corareáchi, slopes with oak–pinyon–*Cupressus*–*Arbutus*, and *Juniperus*, 1840 m, *P.M. Peterson & P. Catalán* 17595, 17606, 17607 (US); Arroyo Baqueachi, at 0.5 km E of small village, 2004 m, *P.M. Peterson & P. Catalán* 17568 (US); Steep slopes above Barranca Basihuare with *Quercus* spp., *Pinus ponderosa*, *P. chihuahuana*, 1815 m, *P.M. Peterson & P. Catalán* 17582 (US); Parque Nacional Barranca del Cobre, 8.8 km NE of La Bufa and 4.8 km S of Kirare, 1730 m, *P.M. Peterson, Annable & Valdés-Reyna* 10826, 10828 (US); Parque Nacional Barranca del Cobre, 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna* 10805 (US); S side of Barranca El Cobre, 29.4 km S of Cusarare on road to Guachochi, 25 Sep 1988, 1800 m, *P.M. Peterson & Annable* 5909 (US); Entering Barranca El Cobre, 28.3 km S of Cusarare on road to Guachochi, 25 Sep 1988, 1900 m, *P.M. Peterson & Annable* 5900, 5905 (US); 8.5 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2400 m, *P.M. Peterson & Annable* 5879, 5886 (US); Camino Guachochi–Creel, 5 km antes del entronque [before junction] a la Bufa, 2400 m, *M.E. Siqueiros* 1619, 1626, 1639 (MEXU); Cusarare, just NW of the church, 2200 m, *Bye* 8099 (MEXU); 9 mi S of Guachochi at edge of Barranca Río Green, 2470 m, *P.M. Peterson & J. Cayouette* 15381 (US); 26.7 mi S of Creel on road to Batopilas, 10 Sep 1989, 2100 m, *P.M. Peterson, Annable & Y. Herrera* 8018 (US); Parque Nacional Barranca del Cobre, 12.6 mi NE La Bufa and 2 mi S Barsigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna* 10805 (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, *P.M. Peterson, Annable & Y. Herrera* 8021 (US); 43 km S of Creel on road to Batopilas, 11 Sep 1989, *P.M. Peterson, Annable & Y. Herrera* 8035 (US); 24.6



km S of Mex 127 and 11.1 km NE of La Bufa, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 8050 (US). **Guadalupe y Calvo:** Between Guadalupe y Calvo and Tecolote, 18 Oct 1959, 2250 m, *Correll* 23237 (US); Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, *P.M. Peterson* 20075, *F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Guerrero:** 33.5 km SW of La Junta on road to Creel, 2260 m, *P.M. Peterson* 9609 (US); Carr. San Juanito–La Junta, 17 km, 2990 m, *B. Tab V. 15* (MEXU); Km 193 carr. [hwy] Chihuahua–Hermosillo, tramo [section] San Pedro–Temochic, 2200 m, *M.A. Vergara* 173 (MEXU); Miñaca, 13 Oct 1910, *Hitchcock* 7742 (US); 33.5 km SW of La Junta on road to Creel, 2260 m, *P.M. Peterson* 9607 (US); Barranca Colorada, Sierra Gazachic, 35 km S of Miñaca, 2500 m, *Pennell* 18957 (US). **Hidalgo del Parral:** 5 mi S of Parral, *Reeder & C. Reeder* 4617, 4618 (US); 1 mi S of Parral on road to México city, *Soderstrom* 828 (US); 4 mi E of Parral, *Reeder & C. Reeder* 3457 (US); 21 km W of Parral and approx. 0.8 km N on dirt road to Torrenocillo, 26 Sep 1988, 1900, *P.M. Peterson & Annable* 5969 (US). **Ignacio Zaragoza:** Ejido de León, 2100 m, *Robert & Passini* 6747 bis (ENCB); 27 km al SW de Buenaventura, 1578 m, *J. Peña* 776 (ENCB); 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, *P.M. Peterson & R.M. King* 8153 (US). **Janos:** Rancho Carretas, Chih.–Son. Border, 1675 m, *L. H. Harvey* 1627 (US); Sierra El Medio, 1700 m, *S. Ibarra s.n.* (INEGI). **Jiménez:** Sta. Eulalia Mts, 1280 m, *E. Wilkinson* 58 (US). **Madera:** About 23 mi SE of Chuhichupa on the road to Madera, 2255 m, *Reeder & C. Reeder* 2670, 2671 (ENCB); About 15 mi S of Madera, 2165 m, *Reeder & C. Reeder* 2640 (ENCB); Mesa de Yerbanís, ejido El Long, 1900 m, *A. Benítez* 1837, 2816, 2817 (CHAPA); Ejido El Long, 1900 m, *O. Bravo* 1293, 1931 (CHAPA); Ciénega Ojo de la Víbora, ejido El Long, 2300 m, *A. Benítez* 2864 (CHAPA); Rancho de Doro-teo, 2100 m, *J.M. Peña* 815 (HUAA). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, *Reeder & C. Reeder* 4888 (ENCB); Minas Nuevas, 8 mi NW of Parral, 1829 m, *Correll* 22736 (US); 19.3 km S of Villa Matamoros on Mex 45 to Durango, 1910 m, *P.M. Peterson & R.M. King* 8263 (US). **Moris:** Yepachic, Chih., 1550 m, *C.W. Pennington* 81 (MEXU). **Namiquipa:** Sierra El Nido, coger part of Arroyo Mesteño, 2600 m, *G.M. Christman* 170 (TAES). **Nuevo Casas Grandes:** E de la sierra La Escondida, en el Cañón de La Madera, 1840 m, *M.A. López s.n.* (INEGI). **Ocampo:** Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8244 (US); Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12529 (US); Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Tenorio & R. Torres* 3802, 4472 (MEXU); Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable* 12533 (US); 40.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 29 Sep 1989, 2390 m, *P.M. Peterson & R.M. King* 8192 (US). **Riva Palacio:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12559 (US); Majalca, 2100 m, *LeSueur* 021 (US); 11.3 km W of Nuevo Majalca, 25.7 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1800 m, *P.M. Peterson & Annable*

5780 (US); Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 23 Sep 1988, *P.M. Peterson & Annable* 5806 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7958 (US). **Ojinaga:** Sierra Matosagua, 1400 m, *G. García s.n.* (INEGI). **Temósachi:** 71.7 km SE of Madera on Mex Hwy 16 and 1.6 km S of Temósachic, 29 Sep 1989, 2090 m, *P.M. Peterson & R.M. King* 8185 (US); Nabogame, 2200 m, *La-ferr* 732 (MEXU). **San Francisco del Oro:** San Francisco del Oro mines, 20 mi from Parral, *Soderstrom* 870, 871 (US). **Santa Bárbara:** Ejido Buenavista, 1950 m, *S. Aguirre* 2052 (MEXU); Rancho El Primero, 1820 m, *S. Ojeda s.n.* (INEGI). **Uruáchi:** 8.6 mi E of Yécora on Hwy 16 to Maycoba, 1880 m, *P.M. Peterson & J. Cayouette* 15324 (US); 20.2 mi W of Maycoba on Hwy 16 to Yécora, 1810 m, *P.M. Peterson & J. Cayouette* 15328 (US).

**225. *Muhlenbergia filiformis*** (Thurb. ex S. Wats.) Rydb., Bull. Torrey Bot. Club 32(11): 600. 1905.

Annual (often appearing perennial); tufted. Culms (3)5–20(35) cm tall, erect or geniculate, often rooting at the lower nodes; internodes glabrous. Sheaths shorter or longer than the internodes, glabrous, smooth or scaberulous; ligules 1–3.5 mm long, hyaline to membranous, rounded to acute; blades 1–4(6) cm long, 0.6–1.6 mm wide, mostly basal, numerous, flat or involute, smooth or scaberulous abaxially, scabrous or pubescent adaxially. Panicles 1.6–6 cm long, 0.2–0.5 cm wide, spike-like, interrupted near the base, long-exserted; primary branches 0.9–1.2 cm long, closely appressed at maturity; pedicels 1–3 mm long, scabrous. Spikelets 1.5–3.2 mm. Glumes greenish-gray, glabrous, 1-veined, rounded to subacute; lower glumes 0.6–1.4 mm; upper glumes 0.7–1.7 mm; lemmas (1.5)1.8–2.5(3.2) mm long, lanceolate, dark greenish, appressed-pubescent on the margins and midveins, hairs shorter than 0.3 mm long, apex scaberulous, acute to acuminate, unawned, sometimes mucronate, mucros shorter than 1 mm; paleas 1.6–2.6(3.1) mm long, lanceolate, scaberulous distally; anthers 0.5–1.2 mm long, purplish. Caryopsis 0.9–1.5 mm long, fusiform, reddish-brown.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia filiformis* grows in open, moist meadows, on gravelly lake shores, along stream banks, and in moist humus near thermal springs at elevations of 1,060–3,050 m. It is usually associated with yellow (three-needled) pine forests, but also grows in many other plant communities. It occurs in Canada, the United States, and extends into northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua, **Bocoyna:** Sánchez, along railway, 21 Oct 1910, *A.S. Hitchcock* 7720 (US).

**226. *Muhlenbergia flavida*** Vasey, Contr. U.S. Natl. Herb. 1(8): 282. 1893.

FIGURE 163A–D

Caespitose delicate annual. Culms 7–40 cm tall, erect, occasionally decumbent, strigulose below nodes. Sheaths glabrous to scaberulous, margins greenish-yellow; ligules 1.5–3 mm long,

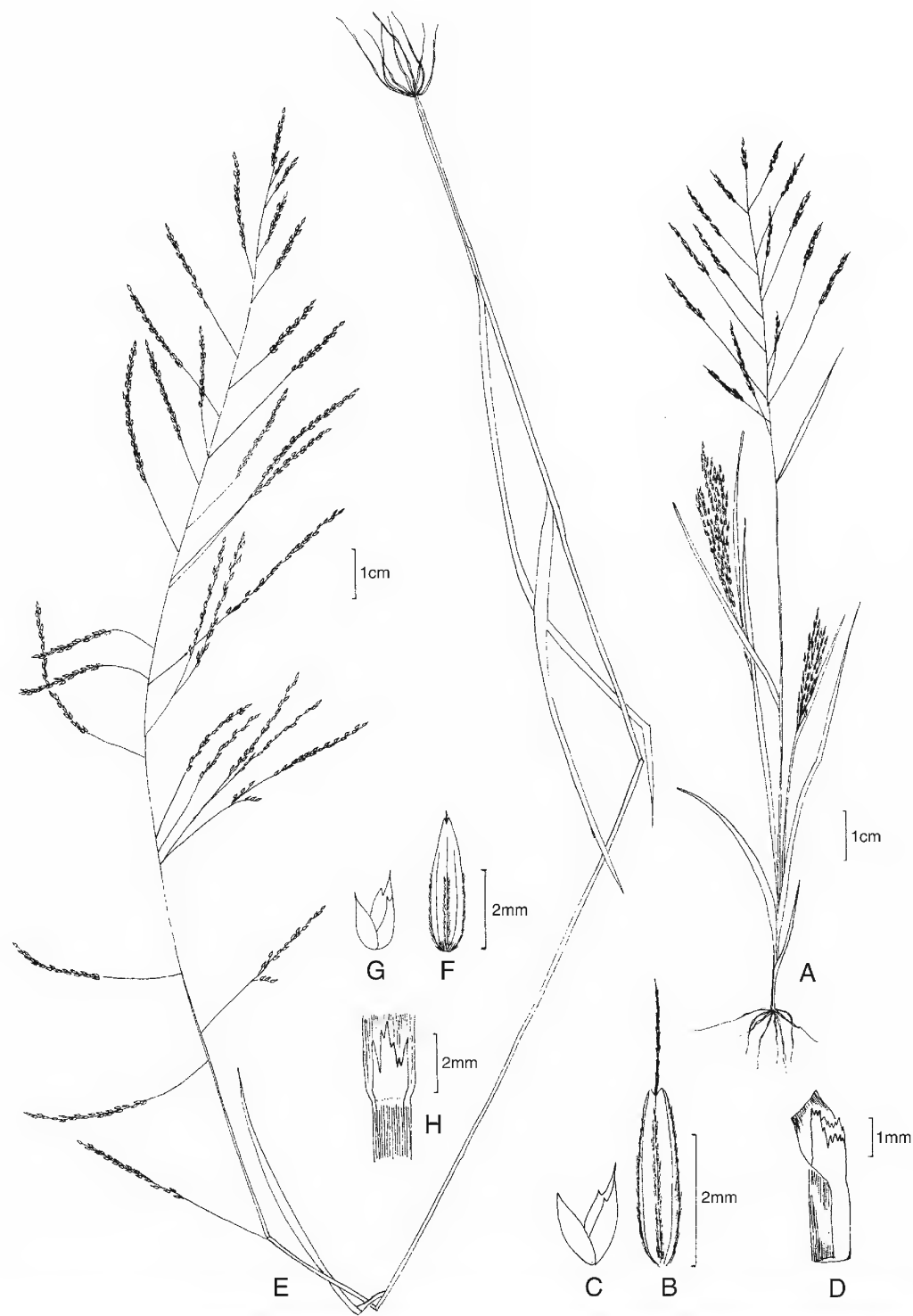


FIGURE 163. *Muhlenbergia flavida*. A. Habit. B. Lemma. C. Glumes. D. Ligule. *Muhlenbergia schmitzii*. E. Habit. F. Lemma. G. Glumes. H. Ligule. Drawn by Midge Gillette for PMP.

membranous, apex obtuse to acute, lacerate to erose; blades 2–9 cm long, 0.4–1.8 mm wide, involute to folded, occasionally flat, sparsely minute-villous above, glabrous to sparsely scaberulous below. Panicles 10–16 cm long, (1)3–6.5 cm wide, narrowly pyramidal; branches 1.6–4 cm long, 1–3 per node, ascending or some divergent, naked to the base with scattered florets; pedicels 0.7–1.5 mm long, slender, appressed, less than ½ as long as the floret. Spikelets 2.2–3 mm long, broad and dorsally flattened, stramineous to yellow, appressed along the branches; glumes 1.5–2 mm long, almost equal, glabrous, 1-veined, ovate lanceolate, awned, awns to 0.8 mm long, lower glume gradually acuminate, upper glume generally abruptly acuminate; lemma 2.2–3 mm long, membranous, yellowish when mature, oblong-ellipsoid, 3-veined, silky-pubescent on margins and midvein to the base, appressed hairs to 0.4 mm long, apex 2-toothed, teeth minute to 0.2 mm long, awn 1–3 mm long, delicate, emerging between lobes; palea 2.2–3 mm long, oblong-ellipsoid, glabrous, apex with 2 minute teeth to 0.2 mm; anthers 0.4–0.6 mm long, olive-green to light brown. Caryopsis 1–1.7 mm long, oblong, compressed, light brown to yellowish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia flavida* grows in pine-oak forests at elevations of 1,900–2,100 m. It is known from Mexico in Chihuahua, Durango, Hidalgo, Jalisco, Michoacán, Nayarit, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chínipas:** Sierra Milpillas 28.1 mi E of Los Tanques on road to Chínipas, 1.6 mi N of Los Chínipas, 2100 m, *P.M. Peterson & Annable 4173, 4174* (MEXU, US). **Guachochi:** 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufa, 2000 m, *M.E. Siqueiros 1647* (MEXU); S side of Barranca del Cobre, 18.3 mi S of Cusarare on rd to Guachochi, 1900 m, *P.M. Peterson & Annable 5908* (US); 24.3 mi S of Creel on road to Batopilas at Barranca del Cobre, 1900 m, *P.M. Peterson, Annable & Y. Herrera 8014* (US); 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufa, 2000 m, *P.M. Peterson, Annable & Y. Herrera 8053* (US); Small spring below Napuchis, 1950 m, *P.M. Peterson & P. Catalán 17659* (CIIDIR, US). **Uruáchi:** 20.2 mi W of Maycoba on Hwy 16 to Yécora, 1800 m, *P.M. Peterson & J. Cayouette 15343* (US).

227. *Muhlenbergia flaviseta* Scribn., U.S.D.A. Div. Bot. Bull. 8: 11, t. 7. 1897.

Caespitose perennial. Culms 20–30 cm tall, glabrous. Leaf blades mostly basal, sheaths puberulent to glabrous, papery with age; ligules 0.2–0.5 mm long, hyaline, truncate and fimbriate; blades 2–7(8.5) cm long, 1.5–2 mm wide, flat, glabrous to scabrous, apex largely acuminate. Panicles 2–5 cm long, 1–2 cm wide, long-exserted, very branched, branches 2.5–3 cm long, ascending, appressed, central axes flattened with 2 ribs, glabrous to scabrous. Spikelets 3.5–4 mm; glumes unequal, greenish, glabrous, oblong-lanceolate; lower glumes (0.5)1–1.8 mm long, 1-veined, mucronate; upper glumes (3)3.5–4.2 mm long, 1- to 3-veined, 3-toothed; lemma (3)3.8–4 mm long, subulate, green to straw color, glabrous, apex entire and awned, the awn 14–16 mm long, yellow, flexuous, scabrous at the base; palea

2.8–3.2 mm long, straw-colored, glabrous; anthers 1.5–2 mm long, oblong, purplish.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia flaviseta* grows in pine-oak forests and grasslands with scattered oaks at elevations of 1,900–2,400 m. This Mexican endemic occurs in the Sierra Madre Occidental and is found in Chihuahua and Durango.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V. 43* (MEXU). **Guachochi:** 25.6 mi S of Creel on road to Batopilas, 2100 m, *Y. Herrera 967* (CIIDIR); 42 km S of Creel on road to Batopilas, 10 Sep 1989, 2100 m, *P.M. Peterson, Annable & Y. Herrera 8034* (US); 32.2 km S of Cusarare on road to Guachochi, S side of Barranca del Cobre, 25 Sep 1988, 2000 m, *P.M. Peterson & Annable 5911* (US); Parque Nacional Barranca del Cobre, 11.3 km NE of La Bufa and 2.1 km S of Kirare, 1950 m, *P.M. Peterson, Annable & Valdés-Reyna 10820* (US). **Guazapares:** Between Tamares and Basoriachic, 2200 m, *Bye 6127* (MEXU). **Moris:** Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable 12513* (US). **Ocampo:** overlook of Casada de Basaseachic, approx. 37 mi W of Tomochic, 2200 m, *P.M. Peterson & Annable 4547* (US); Parque Nacional Cascada de Basaseachic, 1 km airline S of Cascada, 2100 m, *Spellenberg & M. Mahrt 74* (MEXU); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King 8224* (US); 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King 8235* (US); Parque Nacional Cascada de Basaseachic, 1 km airline S of Cascada, 2100 m, *M. Vergara 139* (MEXU).

228. *Muhlenbergia fragilis* Swallen, Contr. U.S. Natl. Herb. 29(4): 206. 1947.

FIGURE 164

Caespitose annual. Culms 10–38 cm tall, erect or spreading; scabrous or strigulous below the nodes; internodes mostly glabrous, smooth or scaberulous. Sheaths 2.4–4.2 cm long, often longer than the internodes, scaberulous, margins hyaline; ligules 1–3 mm long, hyaline, obtuse, irregularly toothed to lacerate, with lateral lobes extended into auricles; blades 1–10 cm long, 0.4–2 mm wide, flat, scabrous abaxially, strigulose adaxially, margins and midveins whitish-thickened; panicles 10–24 cm long, 3.5–11 cm wide, diffuse; primary branches 2.2–6.2 cm long, capillary, diverging 80°–100° from the rachises, straight; pedicels 6–10 mm long, delicate. Spikelets 1–1.2 mm long, appressed to slightly divergent from branch axes; glumes 0.5–1 mm long, equal to subequal, 1-veined, glabrous throughout or obscurely puberulent, hairs about 0.06 mm long, apex obtuse or subacute; lemmas 1–1.2 mm long, oblong-elliptic, membranous, purplish to light brownish, not mottled, glabrous or densely appressed-puberulent on the margins and midveins, apex obtuse,

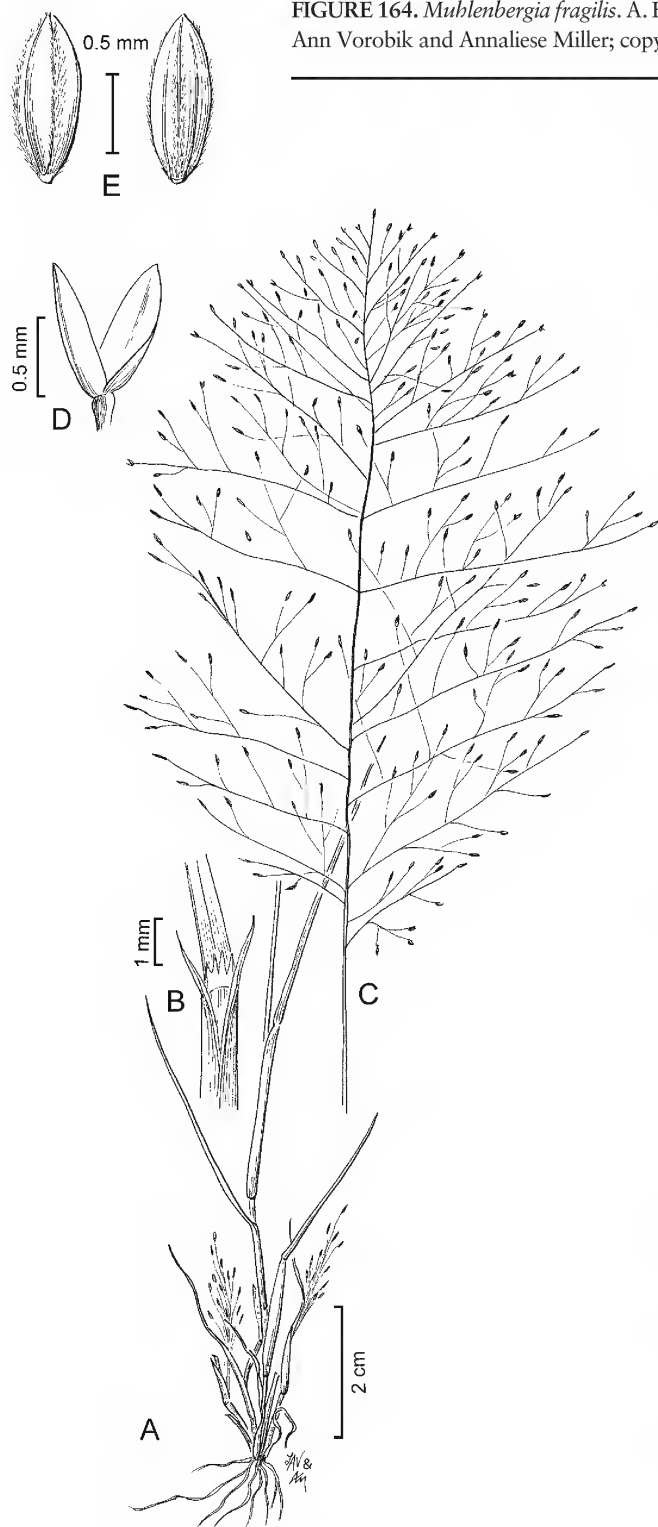


FIGURE 164. *Muhlenbergia fragilis*. A. Habit. B. Ligule. C. Inflorescence. D. Glumes. E. Florets. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

awnless; paleas 0.9–1.2 mm long, oblong-elliptic, densely puberulent between the veins or glabrous, apex obtuse; anthers 0.3–0.5 mm long, purplish. Caryopsis 0.7–0.9 mm long, elliptic, reddish-brown.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia fragilis* grows on rocky talus slopes, cliffs, canyon walls, roadcuts, and sandy slopes, often on calcareous substrates, at elevations of 480–2,200 m from southeastern California to western Texas to south into Mexico in Baja California, Chiapas Chihuahua, Guanajuato, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sinaloa, Sonora, and Veracruz. It is usually found in oak–grama savannahs, thorn scrub forests, oak–yellow pine forests, and pinyon–juniper woodlands.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Buenaventura:** 0.5 mi W of Flores Magón, Reeder & C. Reeder 3495 (US). **Casas Grandes:** 5 km al W de Casas Grandes, 1900 m, Valdés-Reyna VR-751 (CHAPA). **Cuauhtémoc:** 11 mi E of Cuauhtémoc, 1824 m, Reeder & C. Reeder 2616 (ENCB); 3466 (US). **Chihuahua:** Base of la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, Rzedowski 32306 (ENCB); Km 43 carr. [hwy] Chihuahua–Cd. Cuauhtémoc, 1600 m, Hern.-Xol. & C. Tapia N-298 (TAES, CHAPA); Hills near Chihuahua, 1800 m, C.G. Pringle 482 (US); Chihuahua, 1800 m, 14 Oct 1910, Hitchcock 7783 (US); SW of Chihuahua, E. Palmer 76 (US); 6.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1640 m, P.M. Peterson & Annable 12578 (US). **Chínipas:** Sierra Milpillas, 18.2 mi E of Los Tanques on rd to Milpillas, 2100 m, P.M. Peterson & Annable 4170 (US); 3.4 mi W of Sagarivó on road to Chinacas, 10 Sep 2008, rocky slopes with *Acacia*, *Opuntia*, *Quercus*, 1617 m, P.M. Peterson & J.M. Saarela 22171 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, P.M. Peterson & M.B. Knowles 13580 (US); 15.3 mi S of Mex 127 and 6.9 mi NE of la Bufa, 2000 m, P.M. Peterson, Annable & Y. Herrera 8055 (US); Parque Nacional Barranca del Cobre, 8.8 km NE of La Bufa and 4.8 km S of Kirare, 1730 m, P.M. Peterson, Annable & Valdés-Reyna 10824 (US); Parque Nacional Barranca del Cobre, 0.5 km E of La Bufa at the bridge crossing the Río Batopilas, 1000 m, P.M. Peterson, Annable & Valdés-Reyna 10838 (US); Parque Nacional Barranca del Cobre, 6.7 km NE of Batopilas along the Río Batopilas at the Arroyo de Santiago, 690 m, P.M. Peterson, Annable & Valdés-Reyna 10854 (US); West of Munérachi, 1200 m, P.M. Peterson & P. Catalán 17712 (US). **Hidalgo del Parral:** 13.5 mi W of Parral on Hwy 24 towards El Vergel, 2000 m, P.M. Peterson & Annable 4554 (US). **Janos:** Rancho Carretas, Chih–Son. Border, 1675 m, L. H. Harvey 1623 (US). **Jiménez:** Sta. Eulalia Mts, E. Wilkinson 57 (US). **Madera:** About 15 mi S of Madera, 2165 m, Reeder & C. Reeder 2631 (ENCB);

Puerto de El Tenedor, ejido El Long. 2450 m, *O. Bravo* 1930 (ENCB); Zona Arqueológica "40 Casas", 20 km al NW de Las Varas, 2140 m, *Tenorio & Romero* 1836 (ENCB); 12 mi SW of Madera of Hwy 16 towards Cuauhtémoc, 2100 m, *P.M. Peterson & Annable* 4050 (US); 14.5 mi SE of Madera on Mex 16 to La Junta, 2200 m, *P.M. Peterson & R.M. King* 8181 (US). **Ocampo:** Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebegue* 8664 (ENCB); Parque Nacional Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebegue* 8683 (MEXU).

**229. *Muhlenbergia gigantea*** (E. Fourn.) Hitchc., *N. Amer. Fl.* 17(6): 460. 1935.

FIGURE 165F-J

Strongly caespitose perennial. Culms 120–300 cm tall, erect, compressed-keeled near the base, glabrous below the nodes to sometimes scaberulous. Sheaths 12–32 cm long, shorter than internodes, sometimes purplish near base, often changing to brown with age, keels prominent and glabrous; ligules (5)8–15 mm long, membranous, apex lacerate; blades 35–110 cm long, 5–10 mm wide, flat, scaberulous adaxially and glabrous abaxially, margins and keels serrate. Panicle 35–100 long, (8)15–30 cm wide, purple or brown-purplish, branches ascending or pendulous spreading up to 60° from culm axis; pedicels 0.2–2.5 mm long, generally shorter than spikelets, scaberulous; primary branches 6–25 cm long, naked near the base, pendulous to flexuous. Spikelets 1.3–2.6 mm long, erect, purple to brownish-purple; glumes 1.3–2.6 mm long, ovate, generally longer than florets, subequal, 1-veined, often translucent, usually glabrous to scaberulous, apex acute to obtuse; lemma 1.3–2.3 mm long, oblong, awnless, rarely mucronate, glabrous; palea 1.3–2.3 mm long, glabrous, apex acute to obtuse; anthers 0.9–1.3 mm long, yellow to purplish. Caryopsis 1–1.3 mm long, fusiform, reddish-brown.  $2n = 20, 24$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia gigantea* grows in pines or pine-oak forests and tropical forests with *Liquidambar*, *Nyssa*, and *Sabal*, at elevations of 600–2,300 m. In Mexico, this species is known to occur in Chiapas, Chihuahua, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Oaxaca, Puebla, San Luis Potosí, Sinaloa, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Uruáchi:** 9 mi E of Yecora on Hwy 16 towards Maycoba and 10.7 mi S on a dirt road towards Talayote, 1800 m, *P.M. Peterson & Annable* 12481 (US).

**230. *Muhlenbergia glauca*** (Nees) B. D. Jacks., *Index Kew.* 2: 269. 1895.

FIGURE 166A-D

Perennial; with slender, creeping, well-developed rhizomes. Culms 25–60 cm tall, often decumbent, moderately stiff,

sometimes erect; internodes mostly scabrous, retrorsely hirsute below the nodes. Sheaths longer than the internodes, scaberulous; ligules 0.5–2 mm long, truncate to obtuse, erose or lacerate; blades 4–12 cm long, 1–2.6 mm wide, flat to involute distally, not arcuate, scabrous abaxially, hirsute or scabrous adaxially. Panicles 4–12(17) cm long, 0.3–2.4 cm wide, contracted, interrupted below; primary branches 0.3–3 cm long, usually appressed, occasionally diverging to 30° from the rachises; pedicels 0.1–1.2 mm long, scabrous to hirsute. Spikelets 2.4–3.5 mm long; glumes 1.5–3.5 mm long, ½ to about as long as the lemma, equal, 1-veined, veins scabrous, apex acute or acuminate, usually mucronate or awned, awns, if present, to 1.5 mm long; lemmas 2.4–3.4 mm long, elliptic, pubescent on the lower ½ of the midveins and margins, hairs to 0.6 mm long, tawny, apex acuminate to acute, awned, awns 0.1–3(5) mm long, straight; paleas 2.2–3.4 mm long, elliptic, intercostal region pubescent on the lower ½, apex acuminate to acute; anthers 1.8–2.4 mm long, orange, rarely purplish. Caryopsis 1.7–2 mm long, fusiform, brownish.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia glauca* grows on calcareous rocky slopes, cliffs, canyon walls, table rocks, and volcanic rock outcrops in open vegetation associated with oak-pinyon-juniper woodlands at 1,200–2,780 m. It extends from southeastern Arizona, southern New Mexico, and southwestern Texas to northern Mexico in Aguascalientes, Chihuahua, Durango, Guanajuato, Hidalgo, Jalisco, México, Distrito Federal, Puebla, and San Luis Potosí.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Cuauhtémoc:** 12 mi W of Cuauhtémoc, 2128 m, *F.W. Gould* 8945 (TAES). **Chihuahua:** La Campana, 10 km W carr. [hwy] Panamericana, 1700 m, *Valdés-Reyna* VR-331 (TAES); Rocky hills near Chihuahua, 1800 m, *C.G. Pringle* 395, 418 (US); 14.5 mi W of Hwy 45 on road up Los Prietos Canyon, 1910 m, *P.M. Peterson & Annable* 12602 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12564 (US). **Hidalgo del Parral:** NE edge of Parral, 2200 m, *I.W. Knobloch* 744 (TAES). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 5600 ft, *Reeder & C. Reeder* 4628 (US). **Ocampo:** 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8237 (US). **Riva Palacio:** Majalca, *Pennell* 19298 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7940 (US). **San Francisco del Oro:** Ejido Corral de Duarte, 1950 m, *E.S. Blanco* 1552 (MEXU). **Uruáchi:** 20.2 mi W of Maycoba on Hwy 16 towards Yecora, 1800 m, *P.M. Peterson & J. Cayouette* 15341 (US).

**231. *Muhlenbergia imperfecta*** (Nash) Columbus, *Aliso* 28: 66. 2010. *Aegopogon imperfectus* Nash, *N. Amer. Fl.* 17(2): 138. 1912.

*Aegopogon tenellus* var. *abortivus* (E. Fourn.) Beetle.

Slender often sprawling, caespitose annual. Culms (2)6–30 cm tall, glabrous below the nodes; internodes 0.6–6 cm long,



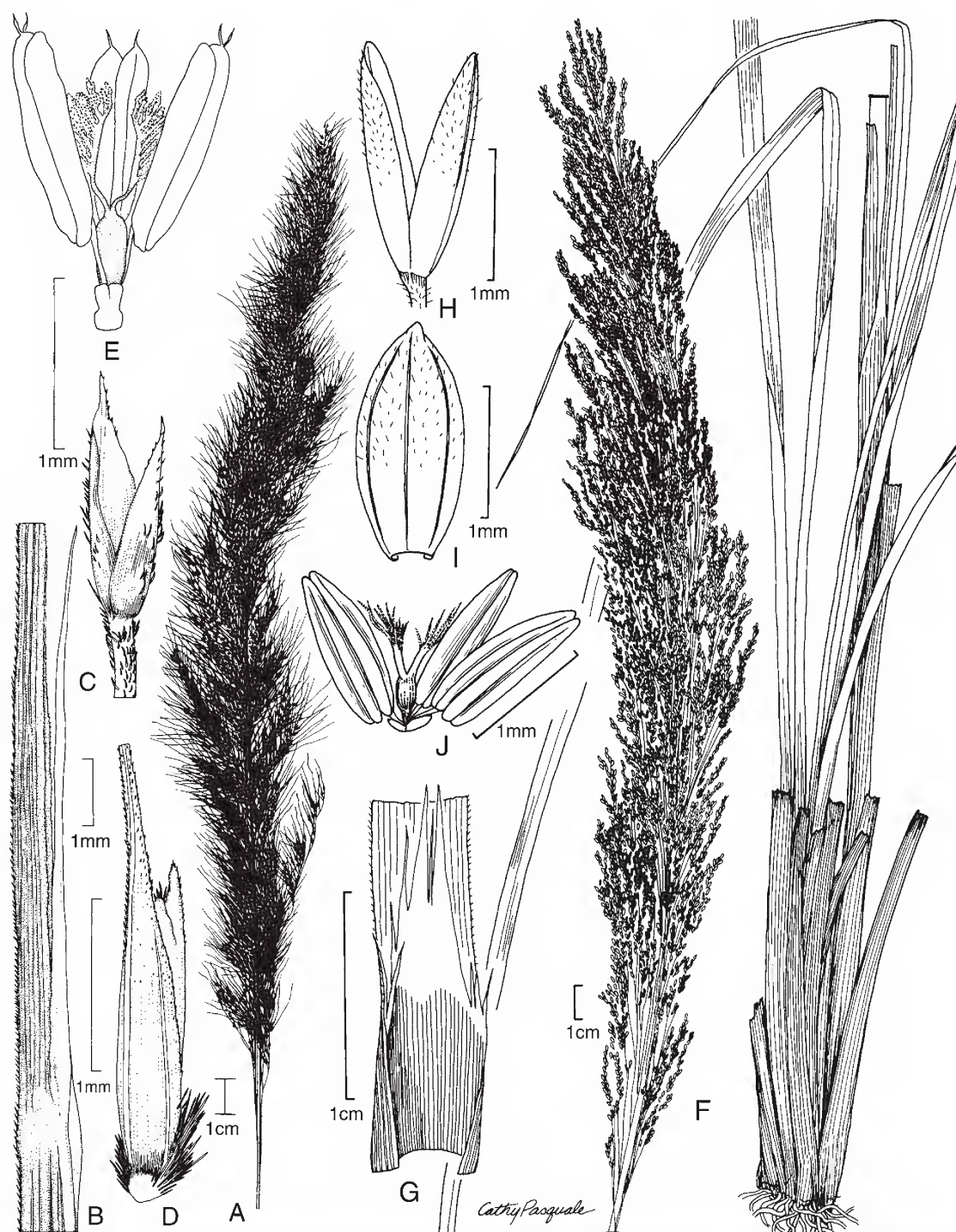


FIGURE 165. *Muhlenbergia scoparia*. A. Habit. B. Ligule. C. Glumes. D. Floret. E. Lodicules, pistil, and stamens. *Muhlenbergia gigantea*. F. Habit. G. Ligule. H. Glumes. I. Lemma. J. Lodicules, pistil, and stamens. Drawn by Cathy Pasquale for Smithsonian Institution, Department of Botany.

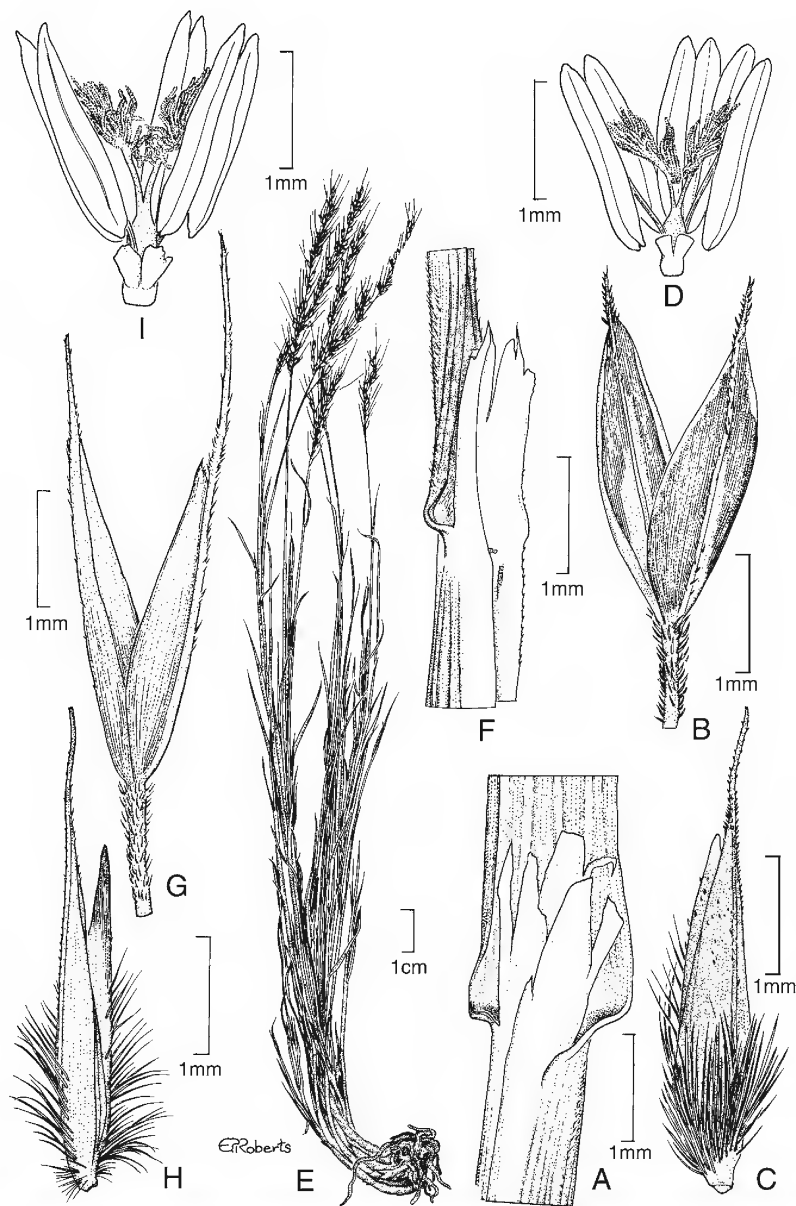


FIGURE 166. *Muhlenbergia glauca*. A. Ligule. B. Glumes. C. Floret. D. Lodicules, pistil, and stamens. *Muhlenbergia polycaulis*. E. Habit. F. Ligule. G. Glumes. H. Floret. I. Lodicules, pistil, and stamens. Drawn by Elisabeth P. Roberts for Smithsonian Institution, Department of Botany.

glabrous to sparingly pubescent. Sheaths mostly 0.5–4.8 cm long, shorter than the internodes, glabrous to sparingly pilose; ligules 0.6–1.5 mm long, apex mostly truncate, lacerate; blades 1.5–4.5 cm long, 0.5–1.5 mm wide, flat, scaberrulent and pubescent above, smooth beneath. Panicles 2–6 cm long, 0.5–1 cm wide,

open, loosely flowered, racemose primary branches 3–5 mm long, 1 per node. Spikelets 1.5–3.2 mm long, often greenish or purplish, the clusters with 1 short-pedicelled spikelet (perfect), the pedicels 0.2–0.6 mm and the other 2 spikelets (staminate or sterile) short-pedicelled, the pedicels about 0.7–1.5 mm long;

glumes (1)1.3–2 mm long, obovate and wider distally, apex shallowly notched, entire or mucronate, the mucro 0.1–0.4 mm long, lobes obtuse or rounded; lemmas 2.5–3.2 mm long, the lateral veins often mucronate, the central vein mucronate to short-awned, the awns never more than 1.5 mm long; paleas 2.2–3 mm long, puberulent, apex 2-mucronate, the mucros less than 0.8 mm long; anthers 0.5–0.8 mm long, yellowish. Caryopsis 1.1–1.3 mm long, obovoid, light brownish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia imperfecta* grows on moist slopes, cliffs, canyons, and roadsides and along or near springs, usually in shaded areas associated with *Pinus cooperi* C. E. Blanco, *P. lumholtzii* spp., *Quercus* spp., *Juniperus deppeana* Steud., *Arctostaphylos pungens*, *Rhus trilobata* Nutt., and *Cercocarpus* at 1,300–2,860 m. It ranges from southern Arizona throughout most of Mexico and Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes:** 21 mi SW of Col. Juárez on road to Hernández Javales, 2 Sep 1985, bosque de pino [pine forest], 2200 m, P.M. Peterson & Annable 4032 (ENCB, US). **Guadalupe y Calvo:** 15.2 mi E of Ocote on hwy 24 towards El Vergel, rock outcrops in pine-oak woodlands, 14 Sep 2006, P.M. Peterson, Sánchez Alvarado & Gómez Ruíz 20062B (US); 9.5 mi E of Guadalupe y Calvo on hwy 24 and 5 mi W of Ocote, rocky slopes in pine-oak-juniper woodlands, 14 Sep 2006, P.M. Peterson, Sánchez Alvarado & Gómez Ruíz 20060 (US). **Guerrero:** 38.6 km SW of La Junta and approx. 70.8 km N of Creel at puente [bridge] Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, P.M. Peterson & Annable 5846 (ENCB, US). **Riva Palacio:** Col. Cumbres de Majalca, approx. 32.2 km W of hwy 45 N of Chihuahua, 22 Sep 1988, pine woods, 1800 m, P.M. Peterson & Annable 5798 (ENCB, US). Colonia Cumbres de Majalca, 33.8 km W of Mex 45 N of Chihuahua City, table rock and rocky slopes, Pine-oak-juniper woodland, 7 Sep 1989, P.M. Peterson, Annable & Herrera Arrieta 7947 (US).

232. *Muhlenbergia implicata* (Kunth) Trin., Gram. Unifl. Sesquifl. 193, t. 5a, f. 26. 1824.

FIGURE 158E–H

Caespitose slender annual. Culms 15–50(70) cm tall, scaberrulous to short-pubescent below the nodes. Sheaths glabrous to scaberrulous; ligules 1–2.5(3) mm long, hyaline; blades 3–5(10) cm long, 1–2 mm wide, flat or loosely involute, short-pubescent above and glabrous below, margins scabrous. Panicle 7–12(20) cm long, 3–5(8) cm wide, diffuse, with the peduncle included in the sheath, axis scaberrulous; branches ascending and spreading up to 90° from the culm axis; pedicels 7–11 mm long, capillary, flexuous, delicate, nodding to reflexed, mostly purplish. Spikelets 2.5–3(4) mm long, purple; glumes 0.2–0.6 mm long, unequal, apex obtuse, often erose; lower glumes 0.2–0.3 mm long; upper glumes 0.3–0.6 mm; lemma 2.5–3(4) mm long, 3-veined, appearing 5-veined, scabrous, apex awned and 2-toothed, the teeth to 1 mm long, the awn 8–26 mm long; palea 2.9–4 mm long,

narrowly lanceolate, glabrous; anthers 0.4–0.9 mm long, purple. Caryopsis 1.8–2.7 mm long, narrowly fusiform.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia implicata* grows on cliffs, on canyon walls, and in open vegetation associated with oak-pinyon-juniper woodlands at elevations of 1,900–2,550 m. It ranges from Mexico to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 14.8 mi NE of El Vergel, 2100 m, P.M. Peterson & Annable 4079 (TAES, US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10717 (US). **Guachochi:** 19 mi E of Guachochi on rd to Balleza, 2100 m, P.M. Peterson & Annable 5938 (US). **Guerrero:** Villa Guerrero, 2550 m, A.A. Beetle & R. Guzmán M-5808 (MEXU); 29 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 2200 m, P.M. Peterson & R.M. King 8196 (US); Tomochi, 2 km alrededor del poblado [around the village], 2100 m, M. Vergara 159 (MEXU). **Hidalgo del Parral:** 24.9 km SE of Balleza, 22.5 km N of hwy 24, W of Parral, 2100 m, P.M. Peterson & Annable 5059, 5951 (MEXU, US). **Jiménez:** Volcán La Alberca, near Villa Jiménez, 2100 m, Rzedowski 40805 (ENCB). **Julimes:** Potrero Mts, 12 Oct 1886, C.G. Pringle 818 (TAES, US). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, P.M. Peterson & Annable 4084, 5973 (US); P.M. Peterson & R.M. King 8250 (US); Reeder & C. Reeder 4629 (US); 18.2 km SE of Villa Matamoros on Mex 45 to Durango, 1780 m, P.M. Peterson, Annable & Valdés-Reyna 10868 (US). **Riva Palacio:** 21 mi W of México 45, N of Chihuahua city, Col. Cumbres de Majalca, 2120 m, P.M. Peterson, Annable & Y. Herrera 7936 (US); 0.7 mi W of Nuevo Majalca, 8.5 mi W of Hwy 45, 1700 m, P.M. Peterson & Annable 4514 (TAES, US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, P.M. Peterson & Annable 4525 (US); 21 mi W of México 45, N of Chihuahua city, Col. Cumbres de Majalca, 2120 m, P.M. Peterson & Annable 5797 (US).

233. *Muhlenbergia ligulata* (E. Fourn.) Scribn. & Merr., Bull. Div. Agrostol. U.S.D.A. 24: 19. 1901. *Chaboissaea ligulata* E. Fourn., Mexic. Pl. 2: 112, t. 1. 1886.

Caespitose perennial. Culms 20–70(90) cm tall, erect, glabrous and occasionally purple below the nodes. Sheaths (0.8)2.5–11(31) cm long, keeled, glabrous, margins hyaline; ligules 6–10 mm long, hyaline, apex acuminate, lacerate; blades 10–15(20) cm long, 1–2.5 mm wide, flat to folded or involute, glabrous above and scaberrulous below. Panicles 6–28 cm long, 1–10 cm wide, narrow, pyramidal; branches short, appressed or narrowly spreading less than 70° from the culm axis, 1 per node. Spikelets 2.8–3 mm long, 1 or 2(3)-flowered, plumbeous, proximal spikelet perfect and distal spikelet staminate or sterile; glumes 1–4 mm long, subequal, 1-veined, glabrous and scabrous along midveins, apex acute to acuminate, occasionally mucronate, the mucro up to 0.5 mm long; lower glume 1–3.2 mm long; upper glume 1.2–4 mm long; lemma 2.5–3.5(4) mm long, lanceolate, compressed-keeled, with appressed hairs on the midvein and margins on the proximal ½,

green-yellowish with gray spots, apex acuminate to acute, unawned, mucronate or awned, the awn up to 2 mm long; palea 2.4–3.5 mm long, lanceolate, unawned, similar to the lemma, apex acute or obtuse; anthers 1–1.2 mm long, yellow to purple. Caryopsis 1.1–1.3 mm long, fusiform, brown.  $n = 8$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia ligulata* grows in seasonally wet areas in grasslands and oak–pine forests at elevations of 2,000–2,616 m. It is known from Mexico in Aguascalientes, Chihuahua, Distrito Federal, Durango, Guanajuato, Jalisco, México, San Luis Potosí, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7693 (US). **Cuahtémoc:** 13.0 mi W of Cuahtémoc on hwy 16, 20 Sep 1986, 2200 m, *P.M. Peterson & Annable* 4532 (ENCB, US); 19 km W of Cuahtémoc on hwy 16, 23 Sep 1988, open meadow along roadside, 2000 m, *P.M. Peterson & Annable* 5819 (MEXU, US); 9 km N of Cuahtémoc on hwy 23, 14 Sep 1989, drainage ditch in wet, blackish soil, 2120 m, *P.M. Peterson & Annable* 8111 (MEXU, US). **Guerrero:** 15 mi E of Guerrero, 4 Sep 1967, *Reeder & C. Reeder* 4858 (ARIZ).

**234. *Muhlenbergia lindheimeri*** Hitchc., J. Wash. Acad. Sci. 24(7): 291. 1934.

FIGURE 162A–E

Strongly caespitose perennial. Culms 50–150 cm tall, stout, erect, not rooting at the lower nodes; internodes mostly glabrous, sometimes puberulent below the nodes. Sheaths 10–45 cm long, shorter or longer than the internodes, glabrous, basal sheaths compressed-keeled, not becoming spirally coiled when old, purplish-brown or yellowish; ligules 10–35 mm long, decurrent, firm and brown basally, membranous distally, acuminate; blades 25–55 cm long, 2–5 mm wide, flat or folded, firm, scaberrulous abaxially, often involute near the apex, scabrous and shortly pubescent adaxially. Panicles 15–50 cm long, (0.6)1–2(3) cm wide, loosely contracted, often purplish-tinged; primary branches 0.5–7 cm long, appressed or strongly ascending, rarely spreading as much as 20° from the rachises; pedicels 0.5–1.2 mm long, scabrous. Spikelets 2.4–3.5 mm long, light grayish; glumes 2–3.5 mm long, equal, longer than the florets, scabrous or smooth, 1-veined, obtuse to acute, occasionally bifid and the teeth to 0.3 mm long, awnless, rarely mucronate, mucros less than 0.2 mm long; lemmas 2.4–3.5 mm long, lanceolate, scabrous or smooth, rarely puberulent near the base, apex obtuse to acute, awned or unawned, the awns 1–4 mm long, straight; paleas 2.4–3.5 mm long, lanceolate, glabrous to puberulent between the veins on the proximal ¼, apex obtuse; anthers 1.1–1.5 mm long, purplish. Caryopsis 1.2–1.6 mm long, fusiform, reddish-brown.  $2n = 20, 26, 30$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia lindheimeri* grows in sandy draws or rocky, calcareous soils, generally in open areas, at elevations of 150–700 m. It is an uncommon species throughout its range, which includes northern Mexico and southern Texas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Madera:** Ciénega Ojo de la Víbora, ejido El Largo, bosque de pino–encino [pine–oak forest], 2300 m, *A. Benítez* 2866, 2867 (CIIDIR; MEXU); Puerto del Tenedor, ejido El Largo, bosque de pino–encino, 2450 m, *A. Benítez* 2918 (CIIDIR).

**235. *Muhlenbergia longiligula*** Hitchc., Amer. J. Bot. 21(3): 136. 1934.

FIGURE 162F–I

Densely caespitose perennial. Culms 60–130 cm tall, robust, erect. Sheaths rounded, rarely compressed, but never keeled, glabrous to scabrous; ligule 20–30 mm long, firm, brown on the base, widely decurrent, membranous at the apex; blades 20–65 cm long, 3–6 mm wide, flat or enrolled on margins, glabrous to scabrous, green changing to brown, firm, involute when mature. Panicle 15–55 cm long, 1–15 cm wide, green to purple; branches 3–13 cm long, ascending or divergent, flowering to the base; pedicels 0.1–2.5 mm long, shorter than florets, glabrous to scabrous. Spikelets 2–3.5 mm long; glumes 2–3.5 mm long, longer than the lemma, occasionally shorter, equal or the upper a little longer than the lower, scabrous or glabrous, 1-veined, acute to acuminate, awnless, sometimes decurrent in a small awn; lemma 2–2.9 mm long, oblong-elliptic, green to purple, scabrous or glabrous, apex acute, often bifid, teeth to 0.2 mm long, awnless or rarely with a small awn of 2 mm; palea 2–3 mm long, a little longer than the lemma, glabrous, oblong-elliptic, scabrous to glabrous, acute; anthers 1–2 mm long, yellow to purple. Caryopsis 1.1–1.5 mm long, fusiform, brown-reddish.  $2n = 22, 24, 29, 30$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia longiligula* grows in pine or oak forests at elevations of 1,000–2,200 m. It occurs from the United States to Mexico in Chihuahua, Durango, Jalisco, Puebla, and Sonora.

This species is very similar to *Muhlenbergia emersleyi* but differs in having rounded basal sheaths, glabrous lemmas, and panicle branches flowered to the base. It is also similar to *M. lindheimeri* but differs in having rounded basal sheaths.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 11 mi SE of Balleza on road to Parral, 1800, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton* 13534 (US). **Batopilas:** White-tuff volcanic outcrops surrounding Napuchis with *Pinus* and many grasses, 2140 m, *P.M. Peterson & P. Catalán* 17682 (US). **Bocoyna:** 7 mi NE of San Rafael on road towards Creel, at Divisidero lookout, 5 Sep 2008, 2240 m, *P.M. Peterson & J.M. Saarela* 22039, 22040 (US). **Buenaventura:** Hills near Buenaventura, 1950 m, *A.A. Beetle M-7877* (MEXU). **Casas Grandes:** 1 mi W of Cuesta Blanca, W of Casas Grandes, 2073 m, *Reeder & C. Reeder* 3222 (ENCB); About 43 mi SW of Casas Grandes, 2100 m, *Reeder & C. Reeder* 2696 (ENCB); W of Casas Grandes, 5 mi S of Hernández, 2200 m, *Reeder, C. Reeder & Soderstrom* 3509 (ENCB, US); 3531 (US); About 38 mi SW of Casas Grandes, 2040 m, *Reeder & C. Reeder* 2699 (ENCB); Near Casas Grandes, *C.H. Townsend* 357 (US); 2 mi S of Hernández, W of Casas Grandes, *Reeder & C. Reeder* 3505

(US). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7667 (US). **Guachochi:** Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 5 Sep 2008, 1890 m, *P.M. Peterson & J.M. Saarela* 22063 (US); Just S of Napuchis, 2162 m, *P.M. Peterson & P. Catalán* 17667 (CIIDIR, US); Approx. 22.5 mi NE of Cieneguita de Barranca on road towards Creel, 2160 m, *P.M. Peterson, P. Catalán, C. López, & G. Villegar* 17692, 17693 (US); Parque Nacional Barranca del Cobre, 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna* 10813A (US); Parque Nacional Barranca del Cobre, 34 mi S of Creel on road towards Samachique, 2150 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton* 13592 (US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton* 13567 (US); 11.5 mi NW of Aboreachi on road towards Creel, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton* 13558 (US). **Guerrero:** Arroyo ancho, 15 Oct 1887, *C.G. Pringle* 1423 (US) Isotype; 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & Annable* 8207 (US); 33.5 km W La Junta on road to Parque Nacional Cascada de Basaseachic, 2200 m, *P.M. Peterson & Annable* 9605 (US). **Madera:** About 15 mi S of Madera, 2165 m, *Reeder & C. Reeder* 2639 (ENCB); About 27 mi NW Madera, 2195 m, *Reeder & C. Reeder* 2663 (ENCB, MEXU); Aserradero El Tres, al N de Cd. Madera, 1900 m, *F. Martínez F-2477* (US). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 3 Oct 1989, grassland, 1910 m, *P.M. Peterson & R.M. King* 8263 (US). **Ocampo:** Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12521, 12535 (US); Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Tenorio & R. Torres* 4472 (MEXU); 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8242 (US); Near Mirador of Cascada Basaseachic, 2022 m, slopes with *Pinus*, 7 Sep 2008, *P.M. Peterson & J.M. Saarela* 22096 (US). **Riva Palacio:** 33-35 km W of Hwy 45 on road towards Benito Juárez, 2200 m, *P.M. Peterson & Annable* 12556 (US). **Temósachi:** 28.7 km al NE de Agua Caliente, 2000 m, *J. Morelos s.n.* (INEGI). **Uruáchi:** 9 mi E of Yécora on Hwy 16 towards Maycoba and 5 mi SE on a dirt road towards Talayote, 1750 m, *P.M. Peterson & Annable* 12477 (US).

236. *Muhlenbergia lucida* Swallen, J. Wash. Acad. Sci. 26(5): 208. 1936.

FIGURE 151F-I

Caespitose perennial. Culms(25)40–60 cm tall, erect, with short, appressed hairs. Sheaths glabrous to pubescent or scabrous, apex puberulent; ligules 3–6(7) mm long, firm to base, apex obtuse, margins entire, decurrent, and with auricles; blades 15–30 cm long, 0.8–1.2 mm wide, firm, involute, flexuous, scabrous. Panicles 12–18 cm long, 6–12 cm wide, included to exerted, open, loosely flowered; branches 5–6 cm long, 1–2

per node, divergent, filiform, flexuous, scabrous or pubescent, naked below, spikelets distant at the end of the branches; pedicels 5–8 mm long, filiform, flexuous. Spikelets 3.8–4.2 mm long, green pale changing to whitish when mature; glumes 2.8–3.8 mm long, subequal, widely oblong-lanceolate, hyaline, veins inconspicuous, short-pubescent over the veins to the base; lower glumes 2.8–3.3 mm long; upper glumes 3.5–3.8 mm; lemmas 3.8–4.2 mm long, hyaline, densely villous, widely ovate-lanceolate, apex bifid, teeth subacute, the teeth about 1 mm long, central vein prominent, reddish, turning into an awn, the awn 10–12 mm long, somewhat geniculate and twisted in the inferior part; paleas 3.8–4.2 mm long, equal to the lemma but a little narrower; anthers 2.1–2.4 mm long, brown to purplish. Caryopsis 2.5–2.8 mm long, fusiform, brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia lucida* occurs in pine-oak forests at elevations of 2,245–2,680 m. This Mexican endemic has been found in Chihuahua, Guanajuato, México, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 34 mi W of Balleza on road towards Guachochi, 2500 m, pine-oaks woodlands, 29 Oct 1995, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13544 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2480 m, *P.M. Peterson, Annable & Valdés-Reyna* 10773 (US). **Batopilas:** 10.7 mi S of Mexico 127 on road to Batopilas, 2245 m, *Y. Herrera, P.M. Peterson & Annable* 946 (CIIDIR); 10.7 mi S of Mexico 127 on road to Batopilas, 2245 m, *P.M. Peterson, Annable & Y. Herrera* 8039 (US). **Bocoyna:** 7 mi NE of San Rafael on road towards Creel, at Divisidero lookout, 5 Sep 2008, 2240 m, *P.M. Peterson & J.M. Saarela* 22041 (US). **Chinipas:** 1 mi E of Saguarivo, 10 Sep 2008, small arroyo with oaks and pines, 1490 m, *P.M. Peterson & J.M. Saarela* 22163 (US). **Guachochi:** Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 5 Sep 2008, *P.M. Peterson & J.M. Saarela* 22047 (US); 16 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *P.M. Peterson, Annable & Y. Herrera* 8083 (MEXU, US); 2 km W of Río Corareáchi and E of Osichi, 1960–2040 m, *P.M. Peterson & P. Catalán* 17623 (CIIDIR, US); White-tuff volcanic outcrops surrounding Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17679 (CIIDIR, US); 8.5 km S of Cusarare on road to Guachochi, 2400 m, *P.M. Peterson & M.B. Knowles* 13561, 13572 (US); 25.6 mi S of Creel on road to Batopilas, 2075 m, *P.M. Peterson & Annable* 8029, 8030 (US); 11 mi on road to La Bufa from jtn with Creel–Guachochi road, 2000 m, *Spellenberg* 8609 (US); 8.5 km S of Cusarare on road to Guachochi, 2400 m, *P.M. Peterson & Annable* 5882 (US); 12.4 km S of Cusarare on road to Guachochi, 2400 m, *P.M. Peterson & Annable* 5896 (US); 19.3 km E of Guachochi, 2300 m, *P.M. Peterson & Annable* 5931 (US); Arroyo Baqueachi, at 1/2 km E of small village, 2004 m, *P.M. Peterson & P. Catalán* 17570 (US). **Guerrero:** 78 km de la Junta de Basaseachic, 2300 m, *R. Fierros* 1691 (MEXU); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & Annable* 8210, 8217 (US); 35 km al SW de Miñaca, Sierra Gazachic, Barranca Colorada,



2300 m, *Pennell* 18955 (US), holotype. **Moris:** Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable* 12515 (US). **Ocampo:** overlook of Casada de Basaseachic, approx. 37 mi W of Tomochic, 2200 m, *P.M. Peterson & Annable* 4551 (US); 29 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & Annable* 8202 (US); 76 mi W of La Junta and 35.2 mi W of Tomochic in Parque Nacional, 2200 m, *P.M. Peterson & Annable* 8228 (US); 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 2100 m, *P.M. Peterson & R.M. King* 8249 (US); Parque Nacional Cascada Basaseachic, 2100 m, *Spellenberg* 8656 (US); Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12534 (US). **Riva Palacio:** Majalca, 2100 m, *LeSueur* 022 (US); Col. Cumbres de Majalca, ca. 32.2 km W of Hwy 45, N of Chih., *P.M. Peterson & Annable* 5803 (US); 21 mi W of México 45, N of Chihuahua city, Col. Cumbres de Majalca, 2190 m, *P.M. Peterson & Annable* 7942, 7973 (US); 37 km W of Mex 45, and ca. 3.2 km W of Col. Cumbres de Majalca, 7 Sep 1989, 2170 m, *P.M. Peterson, Annable & Y. Herrera* 7978 (US). **Uruáchi:** 20.2 mi W of Maycoba on Hwy 16 towards Yécora, 1800 m, *P.M. Peterson & J. Cayouette* 15338 (US).

**237. *Muhlenbergia macroura* (Kunth) Hitchc., N. Amer. Fl. 17(6): 468. 1935.**

Caespitose perennial. Culms 75–200 cm tall, erect, rounded near base, forming dense clumps of 100 culms or more and up to 1 m in diameter, pubescent below the nodes, internodes mostly glabrous. Sheaths 15–40 cm long, shorter than the internodes, glabrous to scaberulous, the basal persistent and keeled with age; ligules (5)8–40(50) mm long, strongly decurrent, splitting into broad auricles, membranous to chartaceous above, brownish, firm, the veins evident below and near margins, apex truncate to obtuse; blades 20–60 cm long, 2–5 mm wide, mostly flat and apically involute, scabrous above and below. Panicles (15)20–40 cm long, 5–12 mm wide, dense, spikelike, erect, exerted and surpassing the blades in height, greenish to greenish-gray; primary branches 0.1–1.2 cm long, ascending and tightly appressed, unexposed, imbricate; pedicels 0.1–1.7 mm long, shorter than the spikelets, scaberulous. Spikelets 3.4–5.6 mm long, erect, strongly laterally compressed, greenish-gray; glumes 3.4–5.6 mm long, linear-elliptic to linear-ovate, usually longer than the lemma, 1-veined, scabrous along the keel, subequal, awnless, the upper slightly longer, apex acute to acuminate, scabrous; lemmas 3.4–5 mm long, elliptic to linear-elliptic, scabrous, greenish-gray; callus pilose, the hairs 0.1–0.3 mm long, apex acute, rarely mucronate, the mucro less than 0.4 mm long; paleas 3.4–5 mm long, about as long as the lemma, scabrous, apex acute; anthers 1.5–2.2 mm long, dark greenish. Caryopsis 2–3 mm long, fusiform, brownish.  $2n = 20, 24, 28$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia macroura* occurs in the Sierra Madre Occidental in northern Mexico from Chihuahua to Chiapas, Guatemala, and Costa Rica; it is

found on upland slopes, in mountain meadows, and in pine or pine-oak forests often in deep humid soils at 1,500–3,400 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Gonogochic region in Ejido San Ignacio Ararenco, *Bye* 5480 (US). **Casas Grandes:** Valle de las Cuevas S Ejido Ignacio Zaragoza, 1760 m, *Tenorio & Romero* 1708 (ENCB, US). **Guachochi:** 1–2 km S of Río Osichi and Río Basihuare junction, 1600 m, *P.M. Peterson & P. Catalán* 17636 (CIIDIR, US); Yamuco at 1 km E of hwy towards Basihuare and Creel, N of Río Urique crossing, 1891 m, *P.M. Peterson & P. Catalán* 17545 (US); Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 5 Sep 2008, 1890 m, *P.M. Peterson & J.M. Saarela* 22062 (US). **Ocampo:** Parque Nacional Cascada Basaseachic, 2000 m, *Tenorio & Romero* 1939 (MEXU); Parque Nacional Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Spellenberg* 7946 (TAES). Cascada de Basaseachic, 3 km al SE de Basaseachic, 1960 m, *R. Torres & Tenorio* 3771 (US).

**238. *Muhlenbergia majalcensis* P. M. Peterson, Syst. Bot. 14(3): 316–318, f. 1. 1989.**

FIGURE 161A–D

Caespitose delicate annual. Culms 15–36 cm tall, erect, reddish, scabrous, strigulous below the nodes. Sheaths 10–32 mm long, shorter than the internode, glabrous to scaberulous, margins hyaline; ligules 1.5–2.0 mm long, hyaline, apex dentate to lacerate, obtuse to rounded, decurrent and extended above to form auricles; blades 2–10 cm long, 0.7–1.4 mm wide, flat to involute, midvein prominent, short-pubescent above and scaberulous below. Panicles 9–15 cm long, 3.5–9.5 cm wide, branches 1–6 cm long, 1–3 per node, ascending to open, capillary; pedicels 3–8 mm long, slender, capillary, curved and reflexed; spikelets at the end of branches, reddish when immature; glumes 1.2–1.5 mm long, equal and longer than the lemma, acuminate, glabrous, faintly 1-veined; lemma 1–1.2 mm long, oval, glabrous, straw color, awnless, apex rounded or obtuse; palea 1–1.2 mm long, oval, glabrous, apex rounded or obtuse; anthers 0.4–0.5 mm long, purplish. Caryopsis 0.8–0.9 mm long, ellipsoid, reddish-brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia majalcensis* occurs in gravelly soils in pinyon-juniper forests at elevations of 2,140–2,200 m. This species is endemic to the Sierra Madre Occidental, known only from Chihuahua (Peterson, 1989).

This species is superficially similar to *M. annua* but differs in having a glabrous lemma and palea, spikelets with curved to reflexed pedicels, and plants 18–36 cm tall in *M. majalcensis* and 8–22 cm tall in *M. annua*. *Muhlenbergia majalcensis* is also similar to *M. capillipes* and can be separated from the latter in having glumes that are longer than lemma and palea, and anthers and caryopses shorter than those found in *M. capillipes*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** 32 km W of Hwy 45 towards Benito Juárez, 2110 m, *P.M. Peterson & Annable* 12550 (US). **Riva Palacio:** 20 mi W of

México 45 and about ½ mi E of Cumbres de Majalca, 2180 m, Y. Herrera, P.M. Peterson & Annable 949 (CIIDIR); 7974 (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, P.M. Peterson & Annable 4573 (US); 21.1 mi W of Hwy 45, 0.4 mi E of Cumbres de Majalca, 20 Sep 1986, 2200 m, P.M. Peterson & Annable 4519 (US); 0.9 km E of entrance to Parque Nacional, Col. Cumbres de Majalca, 2200 m, P.M. Peterson & Annable 5787 (US); 0.5 mi E of Cumbres de Majalca, 2200 m, P.M. Peterson & Annable 5815 (US).

239. *Muhlenbergia microsperma* (DC.) Kunth, Révis. Gramin. 1: 64. 1829.

FIGURE 167A-D

Caespitose annual; rarely appearing as short-lived perennial. Culms 10–80 cm tall, often geniculate at the base, slender, often striate, very branched near the base, scaberulous below the nodes; internodes 1.8–8.6 mm long, mostly scaberulous or smooth. Sheaths 2.2–6.6 mm long, commonly shorter than the internodes, glabrous, smooth or scaberulous; ligules 1–2 mm long, membranous to hyaline, decurrent, margins often extended, apex truncate to obtuse; blades 3–8.5(10) cm long, 1–2.5 mm wide, flat or loosely involute, scabrous below, strigulose above, often deciduous with age. Panicles 6.5–13.5 cm long, 1–6.5 cm wide, open and not densely flowered, often purplish; primary branches 1.6–4 cm long, ascending or diverging to 80° from the rachises, spikelet-bearing to the base; pedicels 2–6 mm long, appressed to divaricate, antrorsely scabrous. Cleistogamous panicles with 1–3 spikelets present in the axils of the lower sheaths. Spikelets 2.5–5.5 mm long; glumes 0.4–1.3 mm long, exceeded by the florets, unequal, 1-veined, apex obtuse, often minutely erose; lower glumes 0.4–1 mm long; upper glumes 0.6–1.3 mm long; lemmas 2.5–3.8(5.3) mm long, narrowly lanceolate, mostly smooth, scaberulous distally, hairy on the callus, lower ½ of the margins, and midveins, with hairs 0.2–0.5 mm long, apex acuminate, awned, the awns 10–30 mm long, straight to flexuous; paleas 2.2–4.8 mm long, narrowly lanceolate, acuminate; anthers 0.3–1.2 mm long, purplish. Caryopsis 1.7–2.5 mm long, fusiform, reddish-brown.  $2n = 20, 40, 60$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia microsperma* grows on sandy slopes, drainages, cliffs, rock outcrops, and disturbed roadsides, at elevations of up to 0–2,400 m. It is usually found in creosote scrub and oak–pinyon woodland associations. Its range extends from the southwestern United States and Mexico in Aguascalientes, Baja California, Baja California Sur, Chiapas, Chihuahua, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Oaxaca, Querétaro, Sinaloa, Sonora, Tlaxcala, Veracruz, and Zacatecas through Central and South America along the Andes.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chínipas:** Sierra Milpillás, 24.1 mi E of Los Tanques on road to Milpillás, pinyon woodlands, 2100 m, P.M. Peterson & Annable 4169 (ENCB, US). **Guachochi:** 6.3 mi S of Cusarare on road to Guachochi, 2420 m, P.M. Peterson & Annable 5888 (US);

Parque Nacional Barranca del Cobre, 0.5 km E of La Bufa at the bridge crossing the Río Batopilas, 1000 m, P.M. Peterson, Annable & Valdés-Reyna 10842 (US). **Moris:** South-western Chihuahua, 2200 m, E. Palmer 158 (TAES, US), type; Río Bonito, Le Saueur 156 (US).

240. *Muhlenbergia minutissima* (Steud.) Swallen, Contr. U.S. Natl. Herb. 29(4): 207. 1947.

FIGURE 168

Delicate annual. Culms 5–40 cm tall, slender, erect or spreading; scaberulous or strigulose below the nodes; internodes mostly glabrous, scaberulous or smooth. Sheaths 0.4–5.2 cm long, shorter or longer than the internodes, smooth or scaberulous; ligules 1–2.6 mm long, hyaline, margins entire, rarely with lateral lobes or auricles not longer than the body of the ligule, apex truncate to obtuse; blades 0.5–4(10) cm long, 0.8–2 mm wide, flat or involute, scabrous below, puberulent above, margins and midveins not whitish-thickened. Panicles 5–16.2(21) cm long, 1.5–6.5 cm wide, open; primary branches 8–42 mm long, often capillary, diverging 25°–80° from the rachises; pedicels 2–7 mm long, straight or curved, but rarely curved as much as 90°; glumes 0.5–0.9 mm long, subequal, sparsely strigulose, at least near the apex, the hairs 0.1–0.3 mm long, 1-veined; lower glumes 0.5–0.8 mm long, obtuse to acute; upper glumes 0.6–0.9 mm long, broader than the lower glumes, obtuse; lemmas 0.8–1.5 mm long, lanceolate, brownish to purplish, glabrous or the midveins and margins appressed-pubescent, apex obtuse to subacute, awnless; paleas 0.8–1.4 mm long, puberulent or glabrous; anthers 0.2–0.7 mm long, purplish. Caryopsis 0.6–0.9 mm long, fusiform to elliptic, brownish.  $2n = 60, 80$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia minutissima* grows in sandy and gravelly drainages, rocky slopes, flats, road cuts, and open sites. It is usually found in yellow pine and oak–pine forests, pinyon–juniper woodlands, thorn scrub forests, and oak–grama savannahs at elevations of 1,200–3,000 m. It occurs in western North America to southern Texas and throughout Mexico to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 0.5 mi NE El Vergel, 2100 m, P.M. Peterson & Annable 4068 (US); 16 mi SW of El Vergel on Hwy 24, Río Green, 2200 m, P.M. Peterson & Annable 4075 (US); 43 mi E of Guachochi and 16 mi W of Balleza, 2100 m, P.M. Peterson & Annable 5935 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10705 (US). **Bocoyna:** 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2330 m, Y. Herrera, P.M. Peterson & Annable 960 (CIIDIR); 5 km al N de Creel, 2200 m, Tenorio & R. Torres 4391 (MEXU); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2350 m, P.M. Peterson, Annable & Y. Herrera 8003 (US); Cabecera de la cañada de Recogata, 2400 m, B. Tah V. 44 (MEXU). **Carichi:** Mojarachic, 5 Sep 1938, I.W. Knobloch 5400 (US); Sánchez, Oct 1910, Hitchcock 7662 (US). **Casas Grandes:** W of Casas

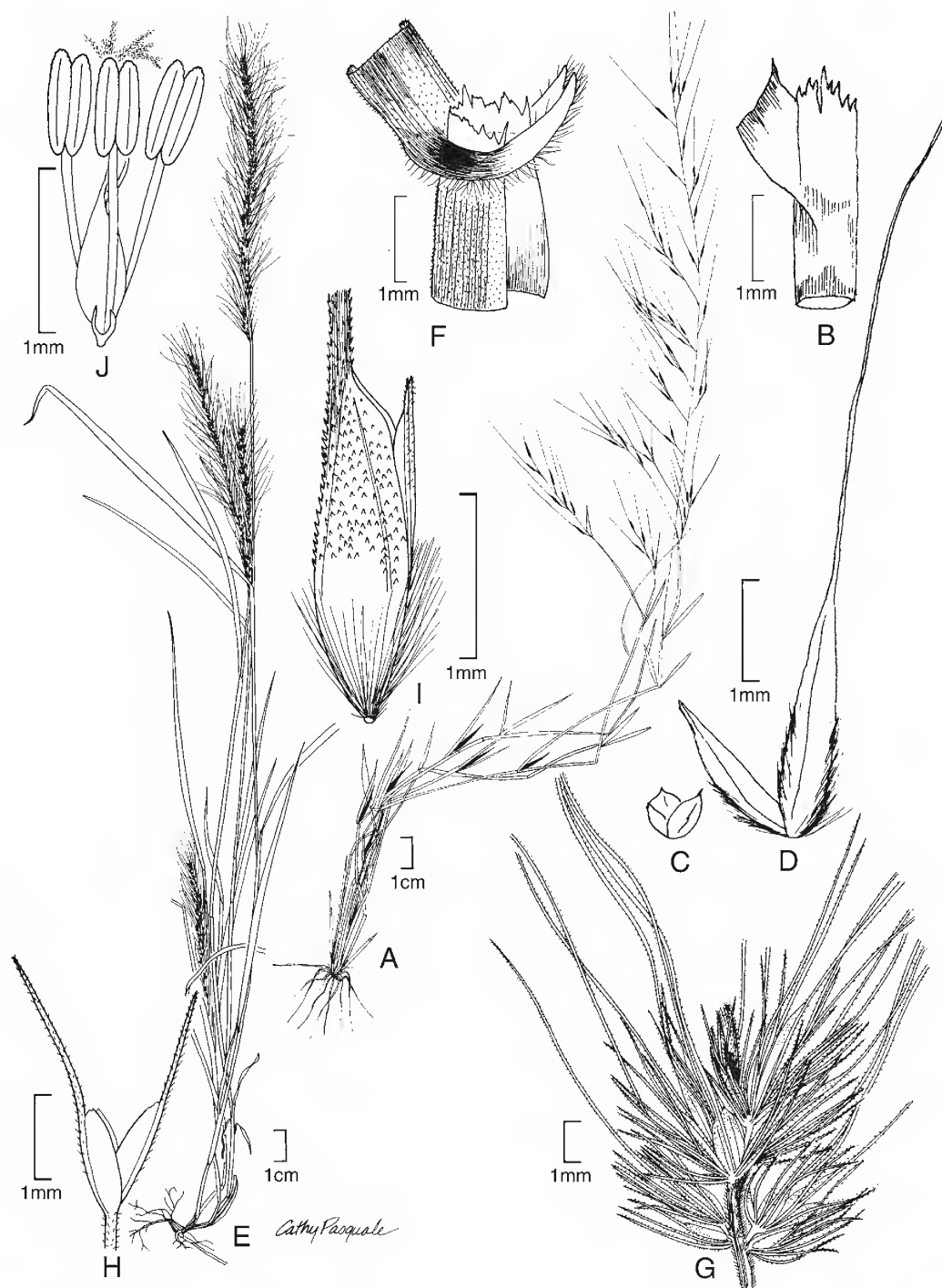


FIGURE 167. *Muhlenbergia microsperma*. A. Habit. B. Ligule. C. Glumes. D. Floret. *Muhlenbergia pereilema*. E. Habit. F. Ligule. G. Portion of inflorescence. H. Glumes. I. Floret. J. Lodicules, pistil, and stamens. Drawn by Midge Gillete for PMP (A–D) and Cathy Pasquale for Smithsonian Institution, Department of Botany (E–J).

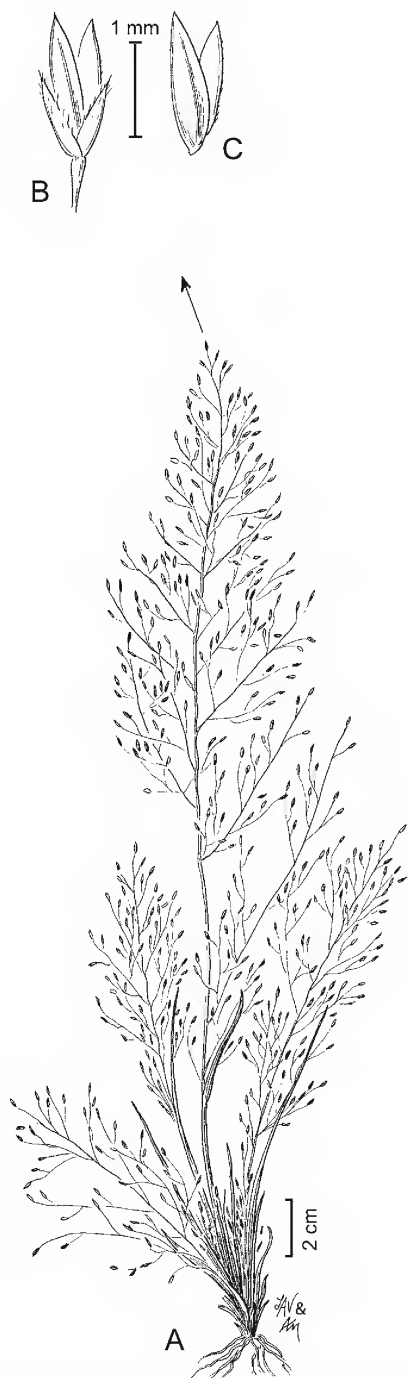


FIGURE 168. *Muhlenbergia minutissima*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

Grandes, 5 mi S of Hernández, 2200 m, Reeder & C. Reeder 3515 (SLPM, US); 3502 (US); 3 mi S of Hernández Javales, 32 mi SW of Col. Juárez, 2200 m, P.M. Peterson & Annable 4042 (US); 2 mi E of Cuesta Blanca, 26 mi W of Col. Juárez, 1950 m, Reeder & C. Reeder 3230 (US). **Cuauhtémoc:** 11 mi E of Cuauhtémoc, 21 Sep 1986, 1850 m, P.M. Peterson & Annable 4530 (US); 12 mi W of Cuauhtémoc, 2120 m, P.M. Peterson & Annable 5823 (US); 13 mi W of Cuauhtémoc, Reeder & C. Reeder 4592 (US). 16 mi W of Cuauhtémoc, Reeder & C. Reeder 3473 (US). **Chihuahua:** Hills near Chihuahua, 1800 m, C.G. Pringle 482 (US); 32 km W of Hwy 45 towards Benito Juárez, 2110 m, P.M. Peterson & Annable 12544 (US); 16.7 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, P.M. Peterson & Annable 12592 (US). **Chinipas:** Sierra Milpillas 28.1 mi E of Los Tanques on road to Chinipas, 1.6 mi N of Los Chincas, 2200 m, P.M. Peterson & Annable 4176 (TAES, US). **Guachochi:** Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, P.M. Peterson & M.B. Knowles 13586 (US); 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, P.M. Peterson & R.M. King 8079, 8173 (US); Parque Nacional Barranca del Cobre, 20 mi NW of Aborreachi on road towards Creel, 2390 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13560 (US); Cusarare, S of Creel, 220 m, Bye 5188 (US); Guachochi, 2400 m, P.M. Peterson & Annable 5914 (US); 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, P.M. Peterson, Annable & Valdés-Reyna 10788 (US). **Guadalupe y Calvo:** Agua Amarilla, 5 mi NW of Chinatú, 10 Oct 1959, Correll & Gentry 22986 (US); 15.2 mi E of Ocote on hwy 24 towards El Vergel, 14 Sep 2006, 2580 m, P.M. Peterson 20061, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guerrero:** Miñaca, 13 Oct 1910, Hitchcock 7767 (US); 35 km al SW de Miñaca, Sierra Gazachic, Barranca Colorada, Pennell 18981 (US); 23.6 mi W of Hwy jct at La Junta on road to Tomochic, 18 mi E of Tomochic, 2200 m, P.M. Peterson & Annable 4536 (US); 35.2 mi W of Tomochic in Parque Nacional Cascada Basaseachic, 2200 m, P.M. Peterson & R.M. King 8226 (US); 22 mi SW of La Junta on rd to Creel, 2200 m, P.M. Peterson & Annable 5828 (US); 24 mi SW of La Junta on road to Creel, 2200 m, P.M. Peterson & Annable 5845 (US); 25 mi W of La Junta on rd to Parque Nacional Cascada Basaseachic, 2200 m, P.M. Peterson & R.M. King 8195 (US); 4.5 km W of Tomochic on Hwy 16, 2200 m, P.M. Peterson & Annable 4544 (ENCB, US). **Madera:** 1.5 km Col. Chuhichupa, 2240 m, F. Ramos 1892 (CHAP); 5 mi N of El Long at edge of small lake, 2375 m, Reeder & C. Reeder 2680, 2681 (SLPM, US); 12 mi SW of Madera of Hwy 16 toward Cuauhtémoc, 4 Sep 1985, 2100 m, P.M. Peterson & Annable 4048 (US); 14.5 mi SE of Madera on Mex 16 to La Junta, 2200 m, P.M. Peterson & R.M. King 8180 (US). **Ocampo:** Along trail just above Cascada de Basaseachic, 1880 m, P.M. Peterson & Annable 12536 (US); Approx. 10 mi E of Basaseachic on Hwy towards La Junta, 2110 m, P.M. Peterson & Annable 12540 (US). **Riva Palacio:** 9.1 mi E of Cumbres de Majalca, 2200 m, P.M. Peterson & Annable 4515 (US); 20.6 mi W of Hwy 45, 0.8 mi E of Cumbres de Majalca, 2200 m, P.M. Peterson & Annable

4518 (US); 0.6 mi E of entrance to Parque Nacional Cumbres de Majalca, 2200 m, P.M. Peterson & Annable 5790 (US); Majalca, LeSueur 159 (US). **Temósachi:** Laguna de la Bavícora southside, 2300 m, P.S. Martin s.n. (ENCB). **Uruáchi:** 7.6 mi E of Yécora on Hwy 16 towards Maycoba, 1840 m, P.M. Peterson & J. Cayouette 15318 (US).

241. *Muhlenbergia montana* (Nutt.) Hitchc., U.S.D.A. Bull. (1915–23) 772: 145, 147. 1920.

FIGURE 169

Densely caespitose perennial. Culms 10–80 cm tall, erect, rounded near base, glabrous below the strictly basal nodes; internodes mostly glabrous, occasionally glaucous. Sheaths 2–35 cm long, longer than the lower internode, glabrous to scaberulous, often glaucous, becoming flat, loose and papery, and occasionally spirally twisted near the base; ligules 4–14(20) mm long, membranous, decurrent, apex acute to acuminate, often lacerate; blades 6–25 cm long, 1–2.5 mm wide, flat becoming loosely involute to subfiliform, somewhat stiff, scabrous below and hirsute above. Panicles 5–25 cm long, (1)2–6 cm wide, narrow to somewhat open, loosely flowered, not dense; primary branches 0.5–10 cm long, ascending, appressed or spreading to 40° from the rachises; pedicels 0.5–6.5 mm long, flattened, scabrous, occasionally stiffly reflexed. Spikelets 3–4.5(7) mm long, erect, occasionally reflexed; glumes (1)1.5–3.2(4) mm long,  $\frac{1}{3}$  to  $\frac{2}{3}$  as long as the lemma, subequal, glabrous to scaberulous above; lower glumes 1-veined, sometimes mucronate, the mucro less than 1 mm long; upper glumes 3-veined, 3-toothed and 3-awned, the teeth (including the awns)  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the glume, and the awns up to 1.7 mm long, apex truncate to acute; lemmas 3–4.5(7) mm long, lanceolate, awned, often greenish or yellowish with dark green or purple mottles, scaberulous above, loosely to densely appressed-pubescent to pilose along the midvein, margins, and proximal  $\frac{1}{2}$  to  $\frac{4}{5}$ , the hairs up to 0.8 mm long, occasionally glabrous, apex acute to acuminate, the awn (2)6–25 mm long, flexuous; paleas 3–4.5(7) mm long, lanceolate, loosely to densely appressed-pubescent to pilose between the veins on the proximal  $\frac{1}{3}$  to  $\frac{4}{5}$ , apex acute to acuminate, scaberulous; anthers 1.5–2.3 mm long, purplish. Caryopsis 1.8–2 mm long, fusiform, light brown.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia montana* grows on rocky slopes, dry meadows, ridgetops, and open grasslands, primarily in upland and mountain habitats at elevations of 1,400–3,500 m. It ranges from the southwestern United States throughout western Mexico to Guatemala.

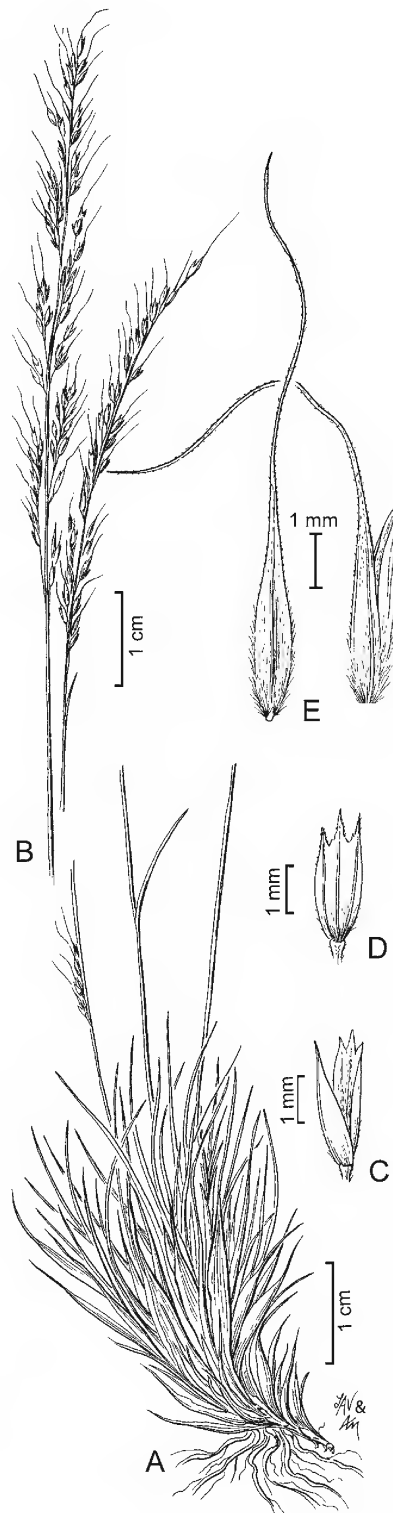


FIGURE 169. *Muhlenbergia montana*. A. Habit. B. Inflorescence. C. Glumes. D. Upper glume. E. Two florets. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.



## SPECIMENS EXAMINED.

## MEXICO. Chihuahua.

**Balleza:** 15 mi E of El Vergel, 2280 m, *Correll* 23253 (ENCB, US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2280 m, *P.M. Peterson, Annable & Valdés-Reyna* 10759 (US); 64.5 km W of Balleza and 30.6 km E of Guachochi, 2620 m, *P.M. Peterson, Annable & Valdés-Reyna* 10770 (US); 34 mi W of Balleza on road towards Guachochi, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13535, 13346 (US); 45 mi W of Balleza on road towards Guachochi, 2560 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13548 (US); 33.8 km W of Parral on Hwy 24 towards El Vergel, 26 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5957 (US); 29 km E of Guachochi on Mex 127 towards Balleza, 13 Sep 1989, 2600 m, *P.M. Peterson, Annable & Y. Herrera* 8087 (US); 43.5 km W of Balleza and 51.6 km E of Guachochi, 2320 m, *P.M. Peterson, Annable & Valdés-Reyna* 10759 (US). **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, *Gentry* 8055 (US); 10.7 mi S of Mexico 127 on road to Batopilas, 2245 m, *Y. Herrera, P.M. Peterson & Annable* 972 (CIIDIR, US); 17.3 km S of Mex 127 on road to Batopilas, 11 Sep 1989, 2245 m, *P.M. Peterson, Annable & Y. Herrera* 8040 (US); Hacienda San Miguel, near Batopilas, 2100 m, *E. Palmer* 10a (TAES, US). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V.* 39, 58 (MEXU). **Buenaventura:** 15 mi W of Flores Magón, 1829 m, *R. Guzmán* 4938 (MEXU). **Carichi:** 1.5 km al SW del Cuiteco, 2060 m, *J. Morelos s.n.* (INEGI); Sánchez, 2400 m, Oct 1910, *A.S. Hitchcock* 7668 (US); 8.5 km al N de Carichi, 2100 m, *J. Morelos s.n.* (INEGI). **Casas Grandes:** W of Casas Grandes, 5 mi S of Hernández, 2200 m, *E. Palmer* 168 (TAES); About 43 mi SW of Casas Grandes, 2100 m, *J.M. Tucker* 2586 (TAES). **Cuauhtémoc:** Rancho La Estancia, 2300 m, *R. Guzmán* 4918 (MEXU); 12 mi W of Cuauhtémoc, 2128 m, *F.W. Gould & D. Watson* 8927 (TAES, US). **Chihuahua:** Chihuahua, Sierra Madre, dry ledges, 7 Oct 1887, *Hitchcock* 1413 (US); Mapula Mts, 2280 m, *C.G. Pringle* 895 (US); 39 km carr. [hwy] Chihuahua–Namiquipa, 2300 m, *M. Vergara* 178 (MEXU); 16.7 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, *P.M. Peterson & Annable* 12593 (US); Sand Dunes, 1300 m, *LeSueur* 057 (US); 17.5 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, *P.M. Peterson & Annable* 12600 (US). **Guachochi:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 5 Sep 2008, *P.M. Peterson & J.M. Saarela* 22046 (US); Arroyo Baqueachi, at 0.5 km E of small village, 2004 m, *P.M. Peterson & P. Catalán* 17565 (US); 25.6 mi S of Creel on road to Batopilas, 2100 m, *Y. Herrera, P.M. Peterson & Annable* 968 (CIIDIR, US); 26.7 mi S of Creel on road to Batopilas, 2105 m, *Y. Herrera, P.M. Peterson & Annable* 970 (CIIDIR); 20 mi S of Creel on road to Batopilas, 2380 m, *Y. Herrera, P.M. Peterson & Annable* 964 (CIIDIR, US); 16 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *Y. Herrera, P.M. Peterson & Annable* 980 (CIIDIR); *M.E. Siqueiros* 1605 (MEXU); 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, *M.E. Siqueiros* 1594, 1630 (MEXU); 18 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, *M.E. Siqueiros* 1591 (MEXU); 25.6 mi S of Creel on road to

Batopilas, 10 Sep 1989, 2100 m, *P.M. Peterson, Annable & Y. Herrera* 8033 (US); 9 mi S of Guachochi at edge of Barranca Río Green, 2470 m, *P.M. Peterson & J. Cayouette* 15377 (US); Cusarare, just NW of the church, 2200 m, *Bye* 8098 (US); Just S of Napuchis, 2162 m, *P.M. Peterson & P. Catalán* 17666 (CIIDIR, US); White-tuff volcanic outcrops surrounding Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17681 (CIIDIR, US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13576 (US); Parque Nacional Barranca del Cobre, 12 mi SE of Samachique on road towards Guachochi, 2150 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13589 (US); Parque Nacional Barranca del Cobre, 34 mi S of Creel on road towards Samachique, 2150 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13591 (US); 12.4 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2400 m, *P.M. Peterson & Annable* 5894 (US); Entering Barranca El Cobre, approx. 25.7 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5899 (US); S side of Barranca El Cobre, approx. 32.2 km S of Cusarare on road to Guachochi, 2000 m, *P.M. Peterson & Annable* 5912 (US); Just N of Guachochi (1 km), 26 Sep 1988, 2500 m, *P.M. Peterson & Annable* 5920 (US); 19.3 km E of Guachochi, 26 Sep 1988, 2300 m, *P.M. Peterson & Annable* 5930 (US); 32.3 km S of Creel on road to Batopilas, 10 Sep 1989, 2380 m, *P.M. Peterson, Annable & Y. Herrera* 8008 (US); 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, *P.M. Peterson, Annable & Y. Herrera* 8019 (US); Parque Nacional Barranca del Cobre, 24.8 km NE of La Bufa on road to Samachic, 2440 m, *P.M. Peterson, Annable & Valdés-Reyna* 10803 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 1891 m, *P.M. Peterson & P. Catalán* 17539 (US). **Guerro:** 24 mi SW of La Junta on road to Creel, 2200 m, *Y. Herrera, P.M. Peterson & Annable* 956 (CIIDIR, US); Km 25 carr. La Junta–Tomochi, 380 m, *Valdés-Reyna* VR-711A (ENCB); Km 25 carr. La Junta–Tomochi, 2380 m, *S. González* 613 (TAES); 4.5 mi W of Tomochic on Hwy 16, 2200 m, *M. Vergara* 166 (MEXU); Carr. San Juanito–La Junta, 17 km, 2290 m, *B. Tab V.* 8 (MEXU); 54.3 km W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8214 (US); Miñaca, 13 Oct 1910, *Hitchcock* 7769 (US); 8 mi N of Santo Tomas, 2300 m, *C.H. Muller* 3396 (US); 38.6 km SW of La Junta and approx. 70.8 km N of Creel at P. Arroyo Ancho crossing, 21 km marker, 2200 m, *P.M. Peterson & Annable* 5847, 5849 (US); 37 km SW of La Junta on road to Creel at the Puente Arroyo Ancho, 2230 m, *P.M. Peterson, Annable & Y. Herrera* 7995 (US); 33.5 km SW of La Junta on road to Creel, 2260 m, *P.M. Peterson* 9608 (US); 40.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 29 Sep 1989, 2390 m, *P.M. Peterson & R.M. King* 8191 (US); 46.7 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8199 (US). **Ignacio Zaragoza:** Ejido de León, 2100 m, *A.A. Beetle* M-8032 (MEXU); 72.5 km S of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2300 m,

*P.M. Peterson & R.M. King 8171* (US). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 1730 m, *L. H. Harvey 1639* (ENCB, US). **Jiménez:** Sta. Eulalia Mts, C.G. Pringle 392, 393 (US). **Madera:** Mesa de Huracán, 2100 m, *J. Peña 802* (CHAPA); Mesa de El Poleo, ejido El Long, 2400 m, *E. Guízar 2683* (CIIDIR); 12 mi SW of Chuhichupa, 2260 m, *Spellenberg & J. Zimmerman 8951* (ENCB); Mesa de Huracán, 2100 m, *J. Peña s.n.* (MEXU); Chuichupa, 2240 m, *LeSueur 111* (US); 71.7 km SE of Madera on Mex 16 and 1.6 km S of Temosachici, 29 Sep 1989, 2090 m, *P.M. Peterson & R.M. King 8186* (US). **Maguarichi:** Maguarichi, 2100 m, *Dávila, Tenorio & J.I. Solís 136* (MEXU). **Moris:** 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable 12514* (US); 9.6 mi E of Maycoba on Hwy 16 towards Yepachic, 1420 m, *P.M. Peterson & Annable 12511* (US). **Ocampo:** overlook of Casada de Basaseachic, approx. 37 mi W of Tomochic, 22 Sep 1986, 2200 m, *P.M. Peterson & Annable 4550* (US); 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King 8233* (US). **Ojinaga:** Sierra El Peguis, 1640 m, *G. García s.n.* (INEGI). **Riva Palacio:** 23 mi W of México 45 and about 2 mi W of Col. Cumbres de Majalca, 2000 m, *Y. Herrera, P.M. Peterson & Annable 950* (CIIDIR, US); 21 mi W of México 45, N of Chihuahua city, Col. Cumbres de Majalca, 2120 m, *Y. Herrera, P.M. Peterson & Annable 947* (CIIDIR, US); Parque Cumbres de Majalca, 2120 m, *E. Estrada s.n.* (ENCB); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable 12552, 12566* (US); Majalca, 2100 m, *Pennell 19315* (US); Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, *P.M. Peterson & Annable 5799, 5811* (US); 37 km W of Mex 45, and ca. 3.2 km W of Col. Cumbres de Majalca, 7 Sep 1989, 2170 m, *P.M. Peterson, Annable & Y. Herrera 7980* (US). **Temósachi:** 28.7 km al NE de Agua Caliente, 2000 m, *J. Morelos s.n.* (INEGI). **Uruáchi:** 20.2 mi W of Maycoba on Hwy 16 towards Yécora, 1810 m, *P.M. Peterson & J. Cayouette 15332* (US); 8.6 mi E of Yécora on Hwy 16 towards Maycoba, 1880 m, *P.M. Peterson & J. Cayouette 15323* (US).

**242. *Muhlenbergia mucronata*** (Kunth) Trin., Gram. Unifl. Sesquifl. 194, t. 5, f. 23. 1824.

*Muhlenbergia laxiflora* Scribn.

FIGURE 170H

Densely caespitose perennial. Culms 75–100(120) cm tall, erect, scabrous or strigulous below the nodes. Sheaths shorter than internodes, glabrous or scaberulous, purplish in part, rounded below; ligules (2)5–8 mm long; blades 20–40 cm long, 2–3 mm wide, flat or loosely involute, attenuate into a long apex, scabrous abaxially, scabrous on ribs adaxially. Panicle (5)10–15(20) cm long, 1–3(6) cm wide, oblong-cylindrical, spreading, purple, rarely purple-greenish, branches 4–8(10) cm long, ascending or appressed. Spikelets (4)4.5–5 mm long, pedicels 1–5(6) mm long, slender, scabrous below spikelets; glumes 1.5–2 mm long, acute, subequal, scabrous near the apex; lemma (4)4.5–5 mm

long, scaberulous between veins, mucronate or shortly awned from 2 minute teeth, the mucro or awn 0.5–1(2) mm long; palea scabrous between the veins, apex acute or acuminate; callus hairy, the hairs 0.5–0.7 mm long; anthers 2–2.2 mm long, purplish. Caryopsis 2–2.5 mm long, about 0.5 mm wide, ellipsoid, reddish-brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia mucronata* grows in oak and pine forests at elevations of 2,050–2,650 m. This Mexican endemic is known from Baja California, Chiapas, Chihuahua, Distrito Federal, Durango, Guanajuato, Mexico City, Oaxaca, Puebla, San Luis Potosí, Sinaloa, Veracruz, and Zacatecas.

*Muhlenbergia mucronata* is morphologically similar to *M. rigida*, differing in the mucronate to short-awned lemmas, narrower panicles, and usually shorter pedicels.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 19.3 km SE of Balleza towards Parral, 26 Sep 1988, 1800 m, *P.M. Peterson & Annable 5946* (US); 34 mi W of Balleza towards Guachochi, 2500, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13540* (US); 64.5 km W of Balleza and 30.6 km E of Guachochi, 2650 m, *P.M. Peterson, Annable & Valdés-Reyna 10778* (US). **Bocoyna:** 7 mi NE of San Rafael on road towards Creel, at Divisidero lookout, 5 Sep 2008, 2240 m, *P.M. Peterson & J.M. Saarela 22038* (US). **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock 7674, 9221* (US). **Guachochi:** Parque Nacional Barranca del Cobre, 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson, Annable & Valdés-Reyna 10813* (US); 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, *P.M. Peterson, Annable & Valdés-Reyna 10794* (US); 61.3 km W of Balleza and 33.8 km E of Guachochi, 2620 m, *P.M. Peterson, Annable & Valdés-Reyna 10776* (US); 30.6 km E of Guachochi on road to Balleza, 26 Sep 1988, *P.M. Peterson & Annable 5934* (US); 8.5 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2400 m, *P.M. Peterson & Annable 5884, 5885* (US); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable 5875* (US); 11.5 mi NW of Aboreachi on road towards Creel, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13557* (US); Just S of Napuchis, 2162 m, *P.M. Peterson & P. Catalán 17663* (CIIDIR, US); Approx. 22.5 mi NE of Cieneguita de Barranca on road towards Creel, 2160 m, *P.M. Peterson, P. Catalán, C. López, & G. Villegar 17691* (US). **Guadalupe y Calvo:** Agua Amarilla, about 5 mi NW of Chinatú, 10 Oct 1959, *Correll & Gentry 22988* (US); Mt. Mohinora, SW Chihuahua, 2050 m, *E.W. Nelson 4902, 4903* (US); 9.5 mi E of Guadalupe y Calvo on hwy 24, 14 Sep 2006, 2570 m, *P.M. Peterson 20058, F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US); Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, *P.M. Peterson 20071, F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Guerrero:** 35.4 km SW of La Junta and approx. 74 km N of Creel, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable 5833* (US); Sierra Madre, porphyry ledges near Guerrero, 27 Aug 1887, 2286 to 2591 m, *C.G. Pringle 1412* (US).

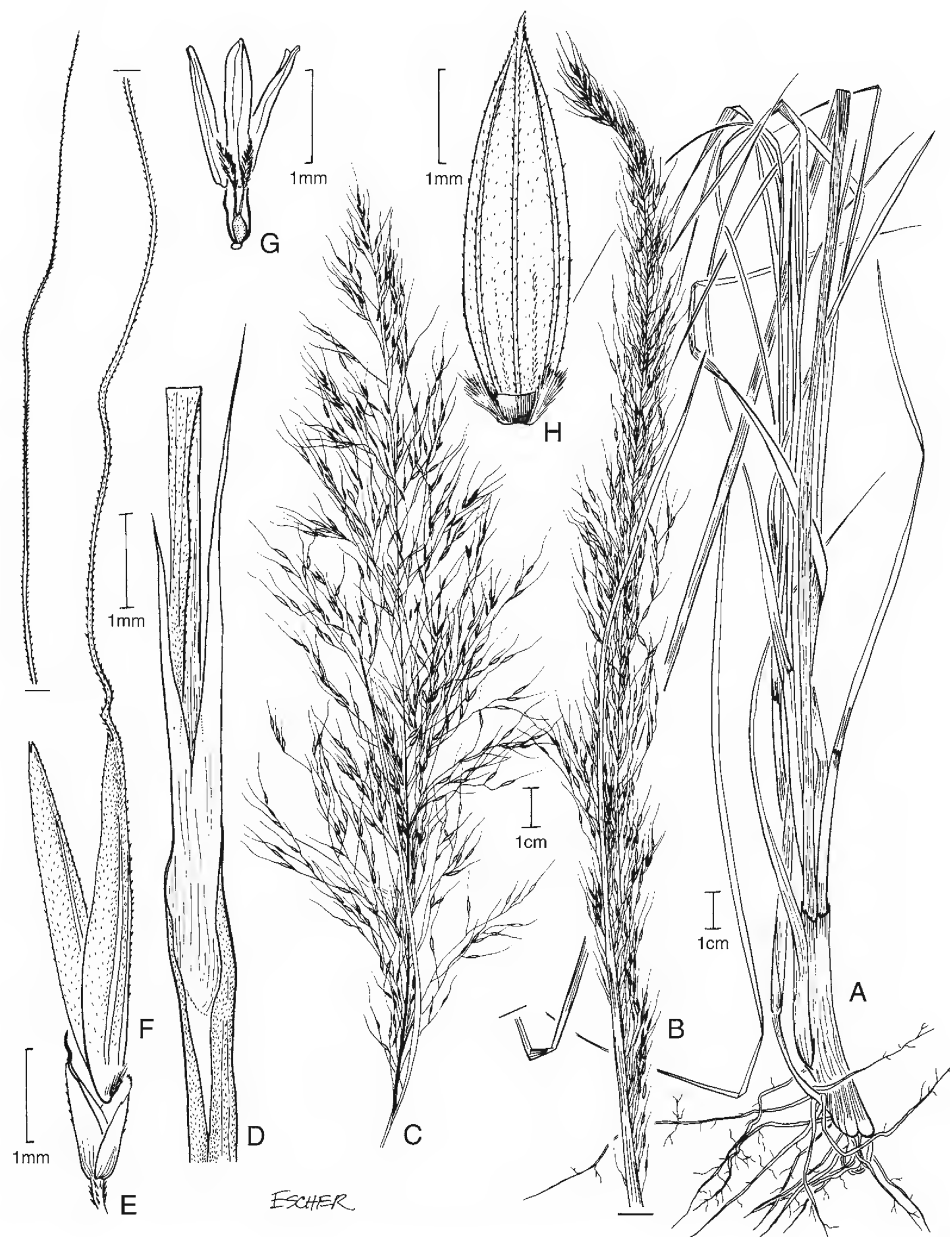


FIGURE 170. *Muhlenbergia rigida*. A. Habit. B. Inflorescence. C. Inflorescence. D. Ligule. E. Glumes. F. Floret. G. Lodicules, pistil, and stamens. *Muhlenbergia mucronata*. H. Floret. Drawn by Susan C. Escher for Smithsonian Institution, Department of Botany.

243. *Muhlenbergia palmeri* Vasey, Bull. Torrey Bot. Club 13(12): 231. 1886.

FIGURE 159A-E

Perennial; densely caespitose. Culms 35–100 cm tall, erect, glabrous. Sheaths rounded, glabrous to scabrous; ligule 1–3 mm

long, firm, truncate, membranous, minutely ciliate; blades 15–50 cm long, 1–3.5 mm wide, flat or involute, glabrous or scabrous. Panicles 15–35 cm long, 0.5–2(3) cm wide, dense to loosely flowered, narrow, straight, rachis scabrous, branches 0.5–8 cm long, plicated, flowered from the base; pedicels 1–6 mm long, hispid. Spikelets 3–4.3 mm long, brown-yellowish to purplish;

glumes (1.7) 2–3.1 mm long, subequal, 1-veined, apex acute to acuminate, awned, the awn 1.2–1.5 mm long, finely scabrous distally; lemmas 3–4.3 mm long, scabrous, lanceolate, apex acuminate, awned, the awns 5–10 mm long, straight, sometimes flexuous; palea 2.9–4.2 mm long, lanceolate, scabrous, apex acute to acuminate; anthers 1.5–2.5 mm long, yellow or spotted with purple. Caryopsis 2–3 mm long, fusiform, brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia palmeri* grows on rocky and sandy soils in oak and pine forests at elevations of 1,580–2,100 m. It ranges from the United States to Mexico in Chihuahua, Michoacán, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 16 mi E of Balleza on road towards Parral, 1950 m, *P.M. Peterson & J. Cayouette* 15385 (US); 11 mi SE of Balleza on road to Parral, 1800 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13529 (US); 7.4 km W of Balleza on road to Guachochi, 1660 m, *P.M. Peterson, Annable & Valdés-Reyna* 10737 (US). **Chihuahua:** Cañón del 54, 1800 m, *J. Peña s.n.* (TAES). **Guachochi:** Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, *P.M. Peterson & M.B. Knowles* 13579 (US); 16 mi E of Guachochi on Mex 127 towards Balleza, 2680

m, *R. Fierros* 1581 (MEXU); Along Río Corareáchi, 1840–1900 m, *P.M. Peterson & P. Catalán* 17605 (CIIDIR, US); 1–2 km S of Río Osichi and Río Basihuare junction, 1600 m, *P.M. Peterson & P. Catalán* 17634 (CIIDIR, US); West of Munérachi along route (trail) to Sorichique, 1701 m, *P.M. Peterson & P. Catalán* 17708 (US). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7750 (US). **Jiménez:** 9 km NNE de El Chamizal, 11 km al SW de Bordo Los Valles, 1580 m, *E. Juárez s.n.* (INEGI). **Madera:** 10 km N of Madera, 2100 m, *Valdés-Reyna* VR-673, VR-667 (ENCB). **Moris:** SW Chihuahua, 1900 m, *E. Palmer* 16 (MEXU, US), type. **Riva Palacio:** Col. Cumbres de Majalca, approximately 32.2 km W of Hwy 45 N of Chihuahua, 23 Sep 1988, 2100 m, *P.M. Peterson & Annable* 5812 (US); 17.7 km W of Nuevo Majalca on road to Cumbres de Majalea, Parque Nacional., 22 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5784 (US). **Uruáchi:** 8.6 mi E of Yécora on Hwy 16 towards Maycoba, 1880 m, *P.M. Peterson & J. Cayouette* 15322 (US).

244. *Muhlenbergia pauciflora* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 91. 1862.

FIGURE 171

Caespitose perennial. Culms 30–70 cm tall, decumbent, wiry, branching at the lower nodes. Sheaths rounded, becoming flat and spreading at maturity, glabrous or scabrous, usually with dark brown necrotic spots; ligules 1–2.5(5) mm long, hyaline, lacerate-ciliate, with auricles (lobes) 1.5–3 mm long; blades 5–12(15) cm long, 0.5–1.5 mm wide, filiform, flat or involute, falling soon, scabrous, often with dark brown necrotic spots. Panicles (2)5–15 cm long, 5–18 mm wide, contracted, interrupted at the base; branches 1–4(6) cm long, appressed or some divergent, densely flowered from the base; pedicels 0.5–3 mm long, scabrous. Spikelets 3.5–5.5 mm long, purplish; glumes 1.5–3 mm long, subequal, glabrous, lanceolate, acuminate or awned, pale green, 1-veined, the veins prominent; lemma 3–5.5 mm long, glabrous, purple, 3-veined, scabrous on veins, awned, the awn of (7)10–20 mm long, slender, flexuous; palea 3–5.5 mm long,



FIGURE 171. *Muhlenbergia pauciflora*. A. Habit. B. Inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

glabrous, scabrous on veins, purple; anthers 1.5–2.1 mm long, purple. Caryopsis 2–2.5 mm long, fusiform, brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia pauciflora* grows on calcareous and saline soils in xerophilous scrublands and oak forests, at elevations of 1,890–2,438 m. It ranges from the United States to northern Mexico in Baja California, Chihuahua, Coahuila, Jalisco, Nuevo León, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** 22 km al S de Humira, 21.8 km al SW de la dev. a La Bufa, 2070 m, Tenorio & R. Torres 3691A (MEXU, US). **Bocoyna:** 7 mi NE of San Rafael on road towards Creel, at Divisadero lookout, 5 Sep 2008, 2240 m, P.M. Peterson & J.M. Saarela 22043 (US). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7701 (US). **Casas Grandes:** ½ mi E of Cuesta Blanca, 1890 m, Reeder & C. Reeder 3228 (ENCB, US); 18 mi W of Col. Juárez, 2073 m, Reeder & C. Reeder 3206 (ENCB, US); About 38 mi SW of Casas Grandes, 2040 m, Reeder & C. Reeder 2697 (ENCB, US). **Chihuahua:** 6.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1640 m, P.M. Peterson & Annable 12580 (US). **Cuauhtémoc:** Rancho La Estancia, 2300 m, R. Guzmán 4913 (MEXU). **Guachochi:** Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 5 Sep 2008, 1890 m, P.M. Peterson & J.M. Saarela 22048 (US); 10.8 km N of Creel on Mex 127 and 20 km S of San Juanito, 10 Sep 1989, 2330 m, P.M. Peterson, Annable & Y. Herrera 8004 (US); 19.3 km E of Guachochi., 26 Sep 1988, 2300 m, P.M. Peterson & Annable 5933 (US); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2200 m, P.M. Peterson & Annable 5875-b (US). **Guadalupe y Calvo:** Río Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, P.M. Peterson 20077, 20079, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guerrero:** 54.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, P.M. Peterson & R.M. King 8209 (US). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, P.M. Peterson & R.M. King 8162 (US). **Madera:** 22 mi SE of Chuhichupa on the road to Madera, 2130 m, Reeder & C. Reeder 2674 (ENCB, US); Chuichupa, 2240 m, LeSueur 0116 (US). **Ocampo:** Along trail just above Cascada de Basaseachic, 1880 m, P.M. Peterson & Annable 12522 (US).

245. *Muhlenbergia pectinata* C. O. Goodd., J. Wash. Acad. Sci. 31(12): 505–506. 1941.

Annual; slender, delicate. Culms 10–35 cm tall, glabrous, filiform, erect or decumbent, branched. Sheaths glabrous, striate, margins sparsely pilose; ligules 0.3–0.9 mm long, hyaline, pilose; blades 1–6 cm long, 0.6–2 mm wide, flat to involute, appressed, sparsely pilose. Panicles 4–12 cm long, 0.5–2.6(4) cm wide, included or exserted in the upper sheath, terminal; branches 2–3.5 cm long, ascending; pedicels 1–3 mm long, glabrous, appressed. Spikelets ascending or straight, overlapping, green with purple spots; glumes 0.8–2(3) mm long, subequal, awned or awnless, glabrous, 1-veined, apex acute or acuminate, awn to 1.5 mm long, lower glumes 0.8–1.7 mm long, upper glumes 1–2(3) mm; lemmas 3–4.5(5) mm long, subulate to lanceolate,

awn 10–30 mm long, slender, flexuous, glabrous to antrorsely scabrous, appearing 5-veined, veins greenish, lateral ones occasionally ciliate, the hairs flattened, swollen at the base; paleas 2.5–4.5 mm long, narrowly lanceolate, glabrous, acuminate; anthers 0.3–0.6 mm long, yellowish. Caryopsis 0.6–3.1 mm long, narrowly fusiform, light brown.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia pectinata* grows in oak and pine forests at elevations of 1,750–2,000 m. It ranges from the United States to Mexico in Chihuahua, Durango, Guerrero, Jalisco, México, Michoacán, Morelos, Nayarit, Oaxaca, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** La Bufa, 21 mi S of Mex 127 on rd to Batopilas, 1750 m, P.M. Peterson, Annable & Y. Herrera 8057 (US). Batopilas, E. Palmer (US). **Chinipas:** Sierra Milpillás, 24.1 mi E of Los Tanques on road to Milpillás, 2100 m, P.M. Peterson & Annable 4280 (ENCB, US); Sierra Milpillás, 22.7 mi E of Los Tanques on road to Milpillás, 2100 m, P.M. Peterson & Annable 4171, 4172 (US); Saguarivo, 53 mi N of Alamos, 9 Sep 2008, 1540 m, P.M. Peterson & J.M. Saarela 22138 (US). Curahui, 9 Sep 2008, tropical deciduous forest, 926 m, P.M. Peterson & J.M. Saarela 22143A (US). **El Tule:** 12 mi SE of Balleza towards Parral, 2000 m, P.M. Peterson & Annable 5948 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 0.6 km W of La Bufa and 22.5 km NE of Batopilas, 1100 m, 20 Sep 1991, P.M. Peterson, Annable & Valdés-Reyna 10844 (US); West of Munérachi along route (trail) to Sorichique, 1701 m, P.M. Peterson & P. Catalán 17707 (US). **Guadalupe y Calvo:** Río Salado, aprox. 3 mi S of Tahonas, Sierra Mohinora, 2300 m, P.M. Peterson & Annable 4578 (US). **Uruachi:** 20.2 mi W of Maycoba on Hwy 16 towards Yécora, 1800 m, P.M. Peterson & J. Cayouette 15342 (US).

246. *Muhlenbergia pereilema* P. M. Peterson, Calsidia 31(2): 293–294, f. 6E–J. 2009. *Pereilema crinitum* J. Presl, Reliq. Haenk. 1(4–5): 233, t. 37, f. a–f. 1830.

FIGURE 167E–J

Delicate, caespitose annual. Culms 15–90 cm tall, decumbent, rooting from lower nodes. Sheaths with oral hairs ciliate, auricles 1–1.5 mm long, falcate; ligules 0.5–1 mm long, membranous, ciliate, irregularly erose; blades 5–15 cm long, 2–3 mm wide, flat, acuminate. Panicles 5–20 cm long, 2–3 cm wide, spiciform, linear, continuous or interrupted; branches 0.5–3.5 cm long, appressed. Spikelets with 1 or 2 perfect spikelets and 2 or 3 sterile spikelets (bristles) in a cluster, the fertile spikelets subtended by an involucre of persistent bristles, the bristles 3 mm long; glumes about 1 mm long, equal, awned, the awns 1.8–2 mm long; fertile florets 1.5–2.6 mm long, lanceolate, laterally compressed, disarticulating below without rachilla extension; lemmas 1.5–2.6 mm long, ovate, keeled, 3-veined, lateral veins close to margins, scabrous, apex acuminate, awned, the awns 20–30 mm long, callus hairy, the hairs 0.3–1 mm long; palea similar to lemma; anthers 3, 0.5–0.7 mm long, yellow. Caryopsis 0.8 mm long, ellipsoid, with adherent pericarp.  $2n = 20$ .



**DISTRIBUTION AND HABITAT.** *Muhlenbergia pereilema* grows in tropical and oak–pine forests at elevations of 1,240–2,450 m. It ranges from throughout Mexico to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela* 22147 (US). **Guachochi:** 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, oak forest, 1930 m, *P.M. Peterson, Annable & Y. Herrera* 8016 (ENCB, US); 24.6 km S of Mex 127 and 11.1 km NE of La Bufa, 11 Sep 1989, oak forest, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 8048 (ENCB, US); Parque Nacional Barranca del Cobre, 11.3 km NE of La Bufa and 2.1 km S of Kirare, 1950 m, *P.M. Peterson, Annable & Valdés-Reyna* 10818 (US). **Temosachi:** Nobogame, 12 Oct 1988, 1800 m, *Laferr.* 2038 (MEXU). **Urique:** km 1 al S de Kirare, Urique, 10 Sep 1999, 1800 m, *T. Lebgue, G. Quintana, E. Estrada* 2454 (NMC).

247. *Muhlenbergia peruviana* (P. Beauv.) Steud., Nomencl. Bot. (ed. 2) 1: 41. 1840.

FIGURE 156E–H

Caespitose annual. Culms 5–30 cm tall, erect, very branched at the base. Sheaths veined with hyaline margins; ligules 1.5–3 mm long, membranous, apex acute, entire to erose; blades 1–5 cm long, 0.6–1.5 mm wide, flat or involute, short-pubescent to glabrous. Panicles 2–8 cm long, 0.3–3.4 cm wide, exsert or included in the superior sheath, contracted or open; branches ascending, flowered from the base; pedicels 0.5–5 mm long, ascending, erect. Spikelets 1.4–4.2 mm long; glumes glabrous or scabrous along veins, narrow or widely lanceolate, greenish, occasionally with spots purplish, apex acute-awned; lower glumes 0.8–2.5 mm long, 1-veined; upper glumes 1–3 mm long, 2- to 3-veined, wider, acute, 2- to 3-toothed, the teeth 0.3–0.8 mm long; lemmas 1.4–4.2 mm long, narrow-lanceolate, pilose in the proximal ½, scabrous above, apex bifid, the teeth 0.5–0.8 mm long, awn 18–22 mm long, arising between slender teeth, flexuous, purple, callus short-pilose; paleas 1.3–3.8 mm long, narrowly lanceolate; anthers 0.5–1 mm long, purplish to yellowish. Caryopsis 1–1.6 mm long, fusiform, brown. *n* = 15.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia peruviana* grows in pine–oak–juniper forests at elevations of 2,000–2,600 m. It ranges from United States and Mexico in Aguascalientes, Chiapas, Chihuahua, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tlaxcala, and Veracruz to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 12.4 mi NE of El Vergel on Hwy 24, SW of Parral, 2200 m, *P.M. Peterson & Annable* 4577 (ENCB, US); 12.1 mi NE of El Vergel on Hwy 24, SW of Parral, 2000 m, *P.M. Peterson & Annable* 4065 (TAES, US); 7.2 mi SW of El Vergel on Mex. Hwy 24, SW of Parral, 2200 m, *P.M. Peterson & Annable* 4073, 4574 (TAES, US); 16 mi SW of El Vergel on Hwy 24, m,

6 Sep 1985, *P.M. Peterson & Annable* 4076 (US); 0.5 mi SW of El Vergel, m, *P.M. Peterson & Annable* 4078 (US); 34 mi W of Balleza on road towards Guachochi, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13543 (US); 45 mi W of Balleza on road towards Guachochi, 2560 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13549 (US); 43.5 km W of Balleza and 51.6 km E of Guachochi, 2320 m, *P.M. Peterson, Annable & Valdés-Reyna* 10760 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2480 m, *P.M. Peterson, Annable & Valdés-Reyna* 10767 (US). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V.* 35, 41 (MEXU). **Carichi:** Sánchez, along railroad, 12 Oct 1910, *Hitchcock* 1354, 7663, 7722 (US). **Chihuahua:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12560 (US). **Guachochi:** 16 mi E of Guachochi on Mex 127 towards Balleza, 2600 m, *Y. Herrera, P.M. Peterson & Annable* 976 (CIIDIR); 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, *Y. Herrera, P.M. Peterson & Annable* 975 (CIIDIR); 29 km E of Guachochi on Mex 127 towards Balleza, 2600 m, *P.M. Peterson & R.M. King* 8082 (US); 19.3 km E of Guachochi, 2300 m, *P.M. Peterson & Annable* 5926 (US); Just N of Guachochi (1 km), 2500 m, *P.M. Peterson & Annable* 5918 (US); 38.4 mi NW of Guachochi on Mex 127 towards Creel, 2440 m, *P.M. Peterson & R.M. King* 8078 (US); Parque Nacional Barranca del Cobre, 20 mi NW of Aborreachi on road towards Creel, 2390 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13559 (US); 12.4 km S of Cusare on road to Guachochi, 2400 m, *P.M. Peterson & Annable* 5890 (US); 2.3 mi W of San Juanito on road towards Baquiriachic, 2590 m, *P.M. Peterson & J. Cayouette* 15360 (US); 3.7 km N of San Juanito on road to Creel, near km 53 marker, 5860 m, *P.M. Peterson & Annable* 5860 (US); 1.1 km N of San Juanito near large lumber mill, 2200 m, *P.M. Peterson & Annable* 5871 (US); 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, *P.M. Peterson, Annable & Valdés-Reyna* 10789 (US). **Guadalupe y Calvo:** Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, *P.M. Peterson* 20068, *F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Guerrero:** Sierra Madre, porphyry ledges near Guerrero, 27 Aug 1887, 2200 m, *C.G. Pringle* 1416 (US), Isotype; 35.4 km SW of La Junta and approx. 74 km N of Creel, 2200 m, *P.M. Peterson & Annable* 5840 (US); 33.6 mi W of Hwy Junction at La Junta on road to Tomochic, 18 mi E of Tomochic., 2200 m, *P.M. Peterson & Annable* 4535 (US). **Ocampo:** Approx. 10 mi E of Basaseachic on Hwy towards La Junta, 2110 m, *P.M. Peterson & Annable* 12539 (US). **Riva Palacio:** Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *P.M. Peterson & Annable* 4526, 4527 (ENCB, US); Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 4, 2200 m, *P.M. Peterson & Annable* 5792 (US).

248. *Muhlenbergia phalaroides* (Kunth) P. M. Peterson, *Caldasia* 31(2): 294–296, f. 7A, B. 2009. *Lycurus phalaroides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 142. 1815 [1816].

Caespitose perennial. Culms 10–40 cm tall, erect or decumbent, nodes and internodes scabrous. Sheaths sparsely

puberulent near margins, compressed-keeled near the base; ligules 0.5–1 mm long, apex truncate; blades 1–6 cm long, 0.3–0.7 mm wide, glabrous to sparsely puberulent, apically navicular to short-acute, margins and midvein not whitish-thickened. Panicles 1–6.5 cm long, 3–5 mm wide, narrow, contracted, spike-like, densely flowered; branches tightly appressed. Spikelets 3–4 mm long, 1-flowered, often paired, the upper perfect, the lower staminate or sterile; lower glumes 0.8–2 mm long, usually 2-veined, rarely 1-veined, usually 2-awned, rarely 1-awned, the awns 0.7–2.5 mm long; upper glumes 1–2 mm long, awn 1–3 mm long; lemmas 3–4 mm long, awned, the awn 1–2.9 mm long, scabrous; anthers 1.5–2.1 mm long. Caryopsis 1.8–2 mm long.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia phalaroides* grows in grasslands, xerophilous scrublands, and pine-oak forests at elevations of 2,218–2,535 m. It ranges from the United States and Mexico in Aguascalientes, Baja California Sur, Chiapas, Chihuahua, Coahuila, Colima, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala, Veracruz, and Zacatecas to Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Casas Grandes: Rancho la Morita en praderas irrigadas [irrigated meadows], 6 Jul 1995, suelos arcillosos arenosos [sandy loam soils], 2000 m, J.C. Gamez, (MEXU). Chihuahua: 38 km W of hwy 45 on road towards Benito Juárez, 17 Oct 1992, pinyon-juniper woodlands, 2230 m, P.M. Peterson & Annable 12557 (US). Guachochi: Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, P.M. Peterson & P. Catalán 17589 (US). Guerrero: km 19 carr. [hwy] la Junta San Juanito, 22 Sept 1997, 2300 m, B. Tah V. 23 (MEXU). Hidalgo del Parral: 10 mi W of Parral on road to El Vergel, 7 Oct 1966, Reeder & C. Reeder 4619 (ARIZ-4620).

249. *Muhlenbergia phleoides* (Kunth) Columbus, Aliso 28: 66. 2010. *Lycurus phleoides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 142, pl. 45. 1815 [1816].

FIGURE 172

Loosely caespitose perennial. Culms 20–60 cm tall, erect to decumbent at the base, scabrous to puberulent just above or below the nodes. Sheaths usually 0.5–3 cm long, glabrous to pubescent, compressed-keeled near the base; ligules 2–3 mm long, acuminate and erose, usually auriculate with triangular lateral lobes 0.5–2.5 mm long, decurrent below; blades 2–8 cm long, 1–1.5 mm wide, flat or folded, glabrous to puberulent adaxially and puberulent to hirsute abaxially, margins and midvein whitish-thickened, apex acute or sometimes with a narrow bristle 0.5–3 mm on the upper blades. Panicles (2)4–10 cm long, 4–8 mm wide, narrow, contracted, densely flowered, and spike-like; primary branches 0.1–0.3 cm long, tightly appressed. Spikelets 3–4 mm long, 1-flowered, often paired, the upper perfect, the lower staminate or sterile; glumes 1–2 mm long, scabrous near apex, awned, the awns 1–5 mm long; lower glumes usually 2(3)-veined and 2-awned; upper glumes 1(2)-veined, the

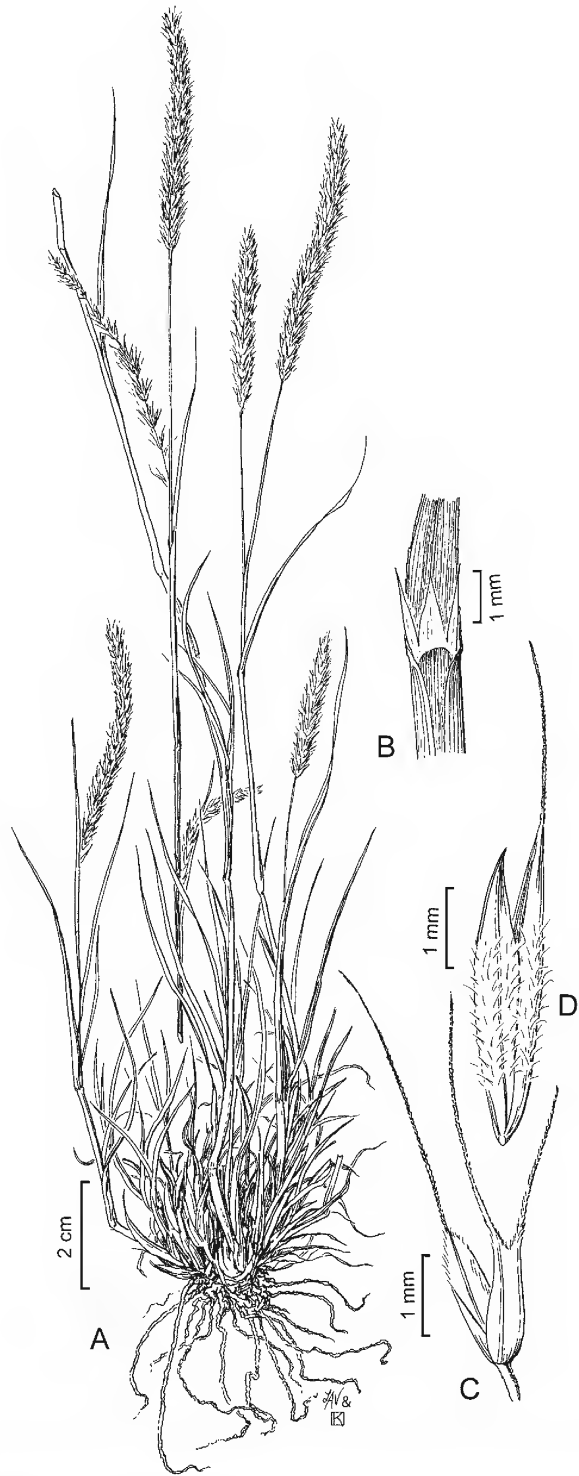


FIGURE 172. *Muhlenbergia phleoides*. A. Habit. B. Ligule. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

awns 2–5 mm long; lemmas 3–4 mm long, puberulent along the margins, awned, the awns 1–3 mm long; paleas 3–4 mm long, puberulent between the veins; anthers 1.5–2 mm long, yellow. Caryopsis 1.8–2.2 mm long, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia phleoides* grows on rocky slopes, in canyons, and on flats, often occurring in calcareous soils and oak–pinyon–juniper woodlands associated with *Quercus gregii* and *Larrea tridentata* at elevations of 1,200–2,500 m. It extends from the southwestern United States in Texas and New Mexico to northern and central Mexico in Aguascalientes, Chihuahua, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, Querétaro, San Luis Potosí, Sonora, Tlaxcala, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Rancho el eden de Aldama hacia [toward] Ojinaga (km desviar a la izquierda por terracería [divert to left by dirt road] 6 km, 27 Oct 2000, matorral [scrub], G. Gómez 708 (MEXU). **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, P.M. Peterson, Annable & Valdés 10729 (CIIDIR); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 18 Sep 1991, pine forest–encino [oak], 2210 m, P.M. Peterson, Annable & Valdés 10723 (CIIDIR). **Batopilas:** SW Chihuahua, Aug 1885, E. Palmer 2 (US). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtémoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22036 (US); cabecera de la Cañada de Recogoata, 22 Sep 1997, pine forest–encino en cañada, 1900 m, B. Tah V. 32 (MEXU). **Bocoyna:** Sánchez, 12 Oct 1910, Hitchcock 7684, 7698 (US). **Buenaventura:** km 11 San Buenaventura–El Carmen 19 Sep 1955, Hern.-Xol. & Mathus N-1944 (US). **Carichi:** Mojarachic, 5 Sep 1938, I.W. Knobloch 5650 (US). **Casas Grandes:** Between Casas Grandes and Sabinal, 4–5 Sep 1899, E.W. Nelson 6356 (US); El Alamito, Col. Cuahutémoc, 12 Aug 1996, P. Olivas, R. Reyes, I. Enríquez & A. Márquez POS836 (UACJ); Rancho Palanganas, mesa del cuervo, 12 Sep 1996, pastizal [pastureland], 2020 m, R. Fierros 129 (MEXU); W of Casas Grandes, 4 Sep 1958, Pine–oak, 1890 m, Reeder & C. Reeder 3229 (MEXU); W of Casas Grandes 9 mi NE of Cuesta Blanca, 18 Sep 1960, pine–oak, 7500 ft, Reeder, C. Reeder & Soderstrom 3554 (MEXU). **Chihuahua:** near Chihuahua, 28 May 1885, C.G. Pringle 426 (ENCB, MEXU, US); 10 Oct 1935, LeSueur Mex-076 (MEXU, US); 8 Oct 1935, LeSueur (MEXU); 14 Oct 1910, Hitchcock 7793 (US); Rancho Experimental La Campana, 23 Oct 1980, pastizal, Valdés-Reyna (MEXU, US); 5 mi SW of Chihuahua on rd to Cuauhtémoc, 6 Oct 1959, Soderstrom 906 (US); A. Melgoza 633 (CIIDIR, ENCB); Ca 30 mi N Cd Chihuahua W Mex Hwy 45 W Boca del Potrero in Mts (opposite jct to El Sauz on Hwy 45) 7.5 road mi W Bella, 16 Jul 1981, 2000 m, D. Ward & R. Worthington 81-375 (NMC); La Campana; 4 km Poniente carr. [hwy] Panamericana, 31 Aug 1973, pastizal con encinos, 1700 m, Valdés-Reyna VR-45, VR-46 (RELC). **Cuauhtémoc:** Cuauhtémoc, Hotel rancho La Estancia, 20 Oct 1981, encinar, R. Guzmán, 4916, (MEXU). **Gómez Farías:** Laguna de Babicora, 15 km al SO [SW] de San Jose de Babicora, 26 Aug 1994, 2250 m, C. Yen

& E. Estrada 3371 (NMC). **Guachochi:** 48.6 mi S of Creel on road towards Rocheachic, 5 Oct 2000, pine forest, 2630 m, P.M. Peterson & J. Cayouette 15379 (US); Cusarare along arroyo just NW of cusarare church, 14 Oct 1977, 2200 m, Bye & W.A. Weber 8121 (MEXU). **Guerrero:** Miñaca, 13 Oct 1910, Hitchcock 7740 (US); al lado [side] de la carr. a Creel, Tonochic, pine forest, 17 Sep 1975, J. Passini & M.F. Robert 6902 (ENCB); carr. la Junta–San Juanito 17 km, 22 Nov 1997, 2290 m, B. Tah V. 10 (MEXU); Tomochi 2 km alrededor del poblado [around the village], 24 Sep 1997, pine forest, 2100 m, B. Tah V. 145 (MEXU). **Guadalupe y Calvo:** Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, P.M. Peterson 20078, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Hidalgo del Parral:** 14 mi E of Parral, 6 Sep 1967, 5300 ft, Reeder & C. Reeder 4877 (ENCB); about 5 mi S of Parral, 7 Oct 1966, 6000 ft, Reeder & C. Reeder 4615 (ENCB). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1460 m, L. H. Harvey 1610 (US). **Juárez:** 1 km al S de Carr. Fed. No. 2 en el km 25, matorral de dunas arenosas [sandy dune scrub] (Izotal con mesquite), 29 Aug 1997, 1150 m, A. Aquino AA78a (UACJ). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, T. Lebgue, G. Quintana & E. Estrada 3782 (NMC); Laguna de Babicora, Camino Las Varas–El Alamillo, 18 Aug 1994, 2250 m, Quintana, Lebgue & Estrada 3245 (NMC); Llanura de Babicora, 19 Sep 1934, Pennell 19011 (US). **Matamoros:** 12 mi S of Villa matamoros, 8 Oct 1966, Reeder & C. Reeder 4826 (ARIZ). **Riva Palacio:** Majalca, 18–20 Aug 1935, LeSueur Mex-016, Mex-023 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7962, 7964 (ENCB, US); 40 km W of Chihuahua, 20 Aug 1939, L. H. Harvey 1548 (US); Rancho las Carretas, de Chih.–Namiquipa desviar [divert] en Campo 73 a la izquierda terracería [to left dirt road] 12 km, 10 Oct 2000, bosque de encino & pino [oak and pine forest], G. Gómez 228, 240 (MEXU). **San Francisco del Oro:** about 10 mi W of Parral on El Vergel, 7 Oct 1966, 6200 ft, Reeder & C. Reeder 4611 (ARIZ, ENCB).

250. *Muhlenbergia polycaulis* Scribn., Bull. Torrey Bot. Club 38: 327. 1911.

FIGURE 166E-I

Loosely caespitose perennial; from a firm, knotty, short rhizomatous base. Culms 15–40(50) cm tall, erect, decumbent at the base, often geniculate, strigulose below the nodes; internodes strigulose to glabrous. Sheaths 1–8 cm long, mostly shorter than the internodes, glabrous to scaberulous, not becoming spirally coiled when old; ligules 0.5–2.5 mm long, erose or lacerate, apex obtuse to acute, margins hyaline, firmer than the central portion; blades 3–10 mm long, 0.5–2 mm wide, flat or involute, occasionally folded, hirsute or scaberulous adaxially and scaberulous or smooth abaxially. Panicles 2–12 cm long, (0.6)1–2 cm wide, narrow, contracted and interrupted below; branches 0.5–4 cm long, ascending and appressed occasionally spreading to 30° from the rachises, spikelet bearing to the base; pedicels 0.1–1.5 mm

long, scabrous. Spikelets 2–3.5 mm long, plump near the middle; glumes (1)1.5–2.6 mm long, more than  $\frac{1}{2}$  as long as the lemma, subequal, 1-veined, mucronate, awned or awnless, scabrous along midvein near the apex, apex acute sometimes acuminate, the awn to 1.4 mm long; lemmas 2–3.5 mm long, elliptic, widest near the middle, appressed-pubescent along the midvein and margins on the proximal  $\frac{1}{2}$  to  $\frac{2}{3}$ , the hairs up to 0.5 mm long, apex acuminate, scaberulous, awned, the awn 10–20(25) mm long, flexuous; paleas 2–3.5 mm long, elliptic, appressed-pubescent between the veins on the proximal  $\frac{1}{2}$ , apex acuminate; anthers 1.5–2 mm long, orange. Caryopsis 1.5–2 mm long, fusiform, brownish.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia polycaulis* grows on steep rocky slopes, canyon walls, cliffs, table rocks, and volcanic rock outcrops in open vegetation associated with *Quercus* spp. and *Pinus* spp. at 1,200–2,410 m. It occurs in southeastern Arizona, southern New Mexico, southwestern Texas, and Mexico in Aguascalientes, Baja California, Baja California Sur, Chihuahua, Durango, Guanajuato, Hidalgo, Jalisco, México, Nayarit, Querétaro, San Luis Potosí, Sinaloa, Sonora, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 19.3 km SE of Balleza towards Parral, 1800 m, P.M. Peterson & Annable 5947 (US); 34 mi W of Balleza towards Guachochi, 2500, P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13536 (US); 11 mi SE of Balleza on road to Parral, 1800, P.M. Peterson, M.B. Knowles, C.H. Dietrich, S.M. Braxton 13532 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2280 m, P.M. Peterson, Annable & Valdés-Reyna 10764 (US); 16 mi E of Balleza on road towards Parral, 1950 m, P.M. Peterson & J. Cayouette 15386 (US); 34 mi W of Balleza on road towards Guachochi, 2500 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13541 (US); 7.4 km W of Balleza on road to Guachochi, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10733 (US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20032, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Bocoyna:** Napahuiche, 2380 m, R.N.F. & J.L.D. s.n. (CHAPA). **Buenaventura,** 6 mi E of Buenaventura, 1768 m, Reeder & C. Reeder 3200 (ENCB, US). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7685 (US). **Casas Grandes:** 22.5 mi SW of Col. Juárez on road to Hernandez Javales, 2 Sep 1985, 2100 m, P.M. Peterson & Annable 4034, 4035 (US); 20 km al SE de Nuevo Casas Grandes, 2100 m, Hern.-Xol. & A.J. Sharp X-10428 (TAES). 20 km al SE de Nuevo Casas Grandes, 27 Aug 1887, 2200 m, C.G. Pringle 1414 (MEXU, US), type. **Chihuahua:** Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, Rzedowski 32343-A (ENCB); Rocky hills near Chihuahua, 2190 m, C.G. Pringle 394 (TAES, US). Mts NW of Chihuahua, H. LeSueur 146 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, P.M. Peterson & Annable 12565 (US); 9.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1690 m, P.M. Peterson & Annable 12585 (US); 14.5 mi W of Hwy 45 on road up Los Prietos Canyon, 1910 m, P.M. Peterson & Annable 12601 (US); Sierra Madre Occidental, slopes with *Quercus*, *Cupressus*, *Pinus*, *Arbutus* and *Juniperus*, 1840–1900 m, P.M.

Peterson & P. Catalán 17597 (US). **Cuahtémoc:** 12 mi W of Cuahtémoc, 2128 m, Reeder & C. Reeder 3185, 4856 (ENCB); 3189 (ENCB, US); 16 mi W of Cuahtémoc, 2400 m, Reeder & C. Reeder 3474 (ENCB, US); 12 mi W of Cuahtémoc, 2128 m, F.W. Gould 8929 (TAES, US). **Guachochi:** approx. 22.5 mi NE of Cieneguita de Barranca on road towards Creel, 2160 m, P.M. Peterson, P. Catalán, C. López, & G. Villegar 17694 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 1891 m, P.M. Peterson & P. Catalán 17551 (US); along Río Corareachi, slopes with *Quercus*, *Cupressus*, *Pinus*, *Arbutus* and *Juniperus*, 1840–1900 m, P.M. Peterson & P. Catalán 17597 (CIIDIR, US); 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, P.M. Peterson, Annable & Valdés-Reyna 10811 (US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13568 (US); Cusarare, along arroyo just NW of Cusarare church, Bye 8096 (US); 41.3 km S of Creel on road to Batopilas, 10 Sep 1989, 2075 m, P.M. Peterson, Annable & Y. Herrera 8031 (US); 29 km E of Guachochi on Mex 127 towards Balleza, 13 Sep 1989, 2600 m, P.M. Peterson, Annable & Y. Herrera 8084 (US); Barranca de Basihuare, 1700 m, P.M. Peterson & P. Catalán 17591 (US). **Guadalupe y Calvo:** Rio Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, P.M. Peterson 20076, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guerrero:** 38.6 km SW of La Junta and approximately 70.8 km N of Creel at P. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5842 (US); 46.7 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, P.M. Peterson & R.M. King 8201 (US); 54.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, P.M. Peterson & R.M. King 8218 (US). **Hidalgo del Parral:** NE edge of Parral, 2200 m, Correll 22684 (ENCB, US). **Ignacio Zaraza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, P.M. Peterson & R.M. King 8161 (US); 72.5 km S of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2300 m, P.M. Peterson & R.M. King 8174 (US). **Namiquipa:** Rancho Teseachic, 2000 m, A.A. Beetle M-3267 (MEXU). **Nuevo Casas Grandes:** E de la sierra La Escondida, en el Cañón de La Madera, 1840 m, M.A. López s.n. (INEGI). **Ocampo:** 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, P.M. Peterson & R.M. King 8236, 8247 (US); Along trail just above Cascada de Basaseachic, 1880 m, P.M. Peterson & Annable 12532 (US). **Riva Palacio:** Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 22 Sep 1988, P.M. Peterson & Annable 5801 (ENCB, US); 21 mi W of Mexico 45, N of Chihuahua city, Col. Cumbres de Majalca, 2120 m, Y. Herrera, P.M. Peterson & Annable 948 (CIIDIR, US); Nuevo Majalca. Approx. 14.5 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, P.M. Peterson & Annable 5770 (US); 11.3 km W of Nuevo Majalca, 25.7 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1800 m, P.M. Peterson & Annable 5781 (US); 17.7 km W of Nuevo Majalca on road to Cumbres de Majalca, Parque Nacional., 22 Sep 1988, 2000 m, P.M. Peterson

♂ Annable 5785 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 2190 m, P.M. Peterson & Annable 7938, 7942A (US).

251. *Muhlenbergia porteri* Scribn. ex Beal, Grass. N. Amer. 2: 259. 1896.

FIGURE 173

Loosely caespitose perennial; with a wiry and knotty base, rhizomes absent, distinctly bushy in appearance. Culms 25–100 cm tall, 0.5–1.5 mm thick near base, erect, geniculate and widely spreading near base, freely branched, branching at the lower and middle nodes; scaberulous below the nodes; internodes mostly scaberulous. Sheaths 0.7–4 cm long, shorter than the internodes, glabrous; ligules 1–2.5(4) mm long, toothed or lacerate, apex truncate, margins hyaline, decurrent, sometimes extended to form short auricles; blades 2–8 cm long, 0.5–2 mm wide, flat or folded, scaberulous adaxially and smooth to scaberulous abaxially. Panicles 4–14 cm long, 6–15 cm wide, open, loosely flowered, usually purple; branches 1–7.5 cm long, widely divergent and stiffly spreading 30°–90° from the rachises, not floriferous basally; pedicels 2–13(20) mm long, scabrous. Spikelets 3–4.5 mm long, often purple; glumes 2–3 mm long, subequal, 1-veined, occasionally mucronate, scabrous along the vein, apex acuminate, occasionally mucronate, the mucro to 0.4 mm long; lemmas 3–4.5 mm long, lanceolate, purplish, appressed-pubescent on the margins and midvein on the proximal  $\frac{1}{2}$  to  $\frac{3}{4}$ , apex acuminate, awned, the awn 5–13 mm long, straight; paleas 3–4.5 mm long, lanceolate, glabrous or appressed-pubescent between the veins on the proximal  $\frac{1}{2}$ , apex acuminate; anthers 1.5–2.3 mm long, purple to yellow. Caryopsis 2–2.4 mm long, ellipsoid, compressed, yellowish-brown.  $2n = 20, 23, 24, 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia porteri* grows on rocky slopes among dry streams, desert flats, grasslands, and scrublands, frequently in the protection of shrubs associated with *Prosopis* spp. and *Larrea tridentata* at 600–1,700 m. It occurs in southeastern California, southern Nevada, southern Utah, Arizona, southern New Mexico, and western Texas to Mexico in Baja California, Chihuahua, Durango, San Luis Potosí, Sonora, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Al-lende:** Rancho La Reforma, 1600 m, J.S. Sierra s.n. (CIIDIR); km 38 carr. [hwy] Chihuahua–Ojinaga, 1210 m, A. Baray 44, 59 (MEXU). **Aguiles Serdán:** Km 2 camino [road] a San Diego de Alcalá, 1260 m, A. González 103 (MEXU). **Ascensión:** 8 km al W de Guzmán, 1230 m, V.M. López V12-2 (INEGI); 7 km al E de Los Chontes, 1250 m, S. Aguirre 29 (INEGI). **Buenaventura:** 15 mi W of Flores Magón, 1829 m, Reeder, C. Reeder & Soderstrom 3497 (ENCB, US). **Camargo:** 6 mi SE of Camargo, 1400 m, Reeder & C. Reeder 4605 (US). **Casas Grandes:** 17 mi S of Nuevo Casas Grandes on Mex 2, 1585 m, P.M. Peterson & R.M. King 8144 (US); Between Casas Grandes and Sabinal, 31 Aug 1899, E.W. Nelson 6349 (US). **Chihuahua:** Hills near Chihuahua, 12 Sep 1885, 1800 m, C.G. Pringle 478 (US); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, M.A.



FIGURE 173. *Muhlenbergia porteri*. A. Habit. B. Glumes. C. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.



*López s.n.* (INEGI); *F. Cárdenas s.n.* (US). **Galeana:** 1.5 km al E de Horcasitas, 1530 m, *C. Yen & E. Estrada* 8993 (CIIDIR); 4 mi NW of Galeana, 1524 m, *Reeder & C. Reeder* 3202 (ENCB). **Hidalgo del Parral:** 14.5 km al NE de Parral, 2.5 km al W de San Gregorio, 1700 m, *E. Aldrete s.n.* (INEGI); Parral–Chihuahua road, 10 km al N of Rio San Pedro, 1375 m, *L. H. Harvey* 1430 (US). **Jiménez:** In arroyo 50 km N of Jiménez, 1 Aug 1939, 1280 m, *L. H. Harvey* 1369 (US); W slopes Sierra Sta. Eulalia, 1400 m, *L. H. Harvey* 1527 (US). **La Cruz:** Km 18 carr. Camargo–Chihuahua, 1220 m, *A. Rodríguez* 108 (MEXU). **Saucillo:** Mancomún El Pajarito Domingueño, 18 km de Las Varas, 1280 m, *R. Fierros* 103 (MEXU).

**252. *Muhlenbergia pubescens* (Kunth) Hitchc., N. Amer. Fl. 17(6): 460. 1935.**

Densely caespitose perennial. Culms 1–1.5 m tall, erect, sparsely to densely pilose, especially near base. Sheaths basal, compressed-keeled and flattened, villous, lacking auricles; ligules 2–4 mm long, membranous, lacerate; blades 25–50 cm long, 2.5–6 mm wide, flat, villous. Panicles 20–40(50) cm long, 2–7 cm wide, erect, columnar, densely flowered, gray to gray-purplish. Spikelets 2.5–3 mm long; glumes 2.5–3 mm long, longer than florets, sparsely to densely villous, widely acute in the apex, subequal or lower glume 1–2 mm shorter than the upper glume; lemmas 2.2–2.6 mm long, villous, awned, the awn 5–10 mm long; anthers 0.8–1.2 mm long, yellow to purplish. Caryopsis 1.2–1.5 mm long, ellipsoid to ovoid, light brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia pubescens* occurs in grasslands, pine–oak–juniper forests at elevations of 1,700–2,000 m. In Mexico it occurs in Aguascalientes, Chihuahua, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Nayarit, Oaxaca, Puebla, San Luis Potosí, Tlaxcala, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 34 mi W of Balleza on road towards Guachochi, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13537 (US); 16.1 km W of Balleza and 77.9 km E of Guachochi, 1990 m, *P.M. Peterson, Annable & Valdés-Reyna* 10748 (US); 56.4 km W of Balleza and 38.7 km E of Guachochi, 2480 m, *P.M. Peterson, Annable & Valdés-Reyna* 10772 (US). **Chihuahua:** Rocky hills near Chihuahua, 1800 m, *C.G. Pringle* 391 (US); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, *Rzedowski* 32311 (CHAPA). **Guachochi:** 12.4 km S of Cusarare on road to Guachochi, 25 Sep 1988, 2400 m, *P.M. Peterson & Annable* 5895 (US); 9 mi S of Guachochi at edge of Barranca Río Green, 2470 m, *P.M. Peterson & J. Cayouette* 15375 (US); White-tuff volcanic outcrops surrounding Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17677 (CIIDIR, US); 43 km S of Creel on road to Batopilas, 11 Sep 1989, *P.M. Peterson, Annable & Y. Herrera* 8036 (US). **Guerrero:** overlook of Casada de Basaseachic, approx. 37 mi W of Tomochic, 22 Sep 1986, 2200 m, *P.M. Peterson & Annable* 4549 (US); 46.7 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 2260 m, *P.M. Peterson & R.M. King* 8200 (US); 54.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic,

30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8205 (US). **Hidalgo del Parral:** 5 km al E de Parral, 1800 m, *S. Ojeda s.n.* (INEGI); 5 km al S de Parral, 2000 m, *E. Aldrete s.n.* (INEGI); 5 mi S of Parral, 1900 m, *Reeder & C. Reeder* 4616 (US). **Matamoros:** 19.3 km S of Villa Matamoros on Hwy 45 to Durango, 1800 m, *P.M. Peterson & Annable* 5982 (US); 19.3 km S of Villa Matamoros on Mex 45 to Durango, 3 Oct 1989, 1910 m, *P.M. Peterson & R.M. King* 8258 (US). **Moris:** Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora–Chihuahua boundary, 1540 m, *P.M. Peterson & Annable* 12516 (US). **Riva Palacio:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12563 (US); Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 2100 m, *P.M. Peterson & Annable* 5802 (US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7945 (US).

**253. *Muhlenbergia pubigluma* Swallen, Proc. Biol. Soc. Wash. 56: 78. 1943.**

Densely caespitose perennial. Culms (50)65–125 cm tall, stout, erect, puberulent below the nodes, 2 or 3 nodes per culm; internodes glabrous. Sheaths 10–32 cm long, usually longer than the internodes, scaberulous, basal sheaths compressed-keeled, glabrous, dark brown with the age; ligules 5–13 mm long, membranous above and firm and brown below, decurrent; blades 10–35 cm long, 1.5–3 mm wide, folded to involute, attenuate, firm, scabrous with whitish pubescence, the short hairs about 0.1 mm long, these slightly longer on the upper surface and near the collar. Panicles (15)20–34 cm long, 1–3 cm wide, narrow, loosely contracted; primary branches 1–6 cm long, mostly ascending and appressed, rarely spreading to 20° from the rachises, grayish-green; pedicels 0.3–2.5 mm long, usually shorter than the spikelets, scabrous. Spikelets 2.5–3.5 mm long; glumes 2–3.3 mm long, usually shorter than the floret, 1-veined, lightly pubescent especially near the base, apex obtuse to acute, awnless; lemmas 2.8–3.5 mm long, lanceolate, grayish-green to purplish, the lateral veins indistinct, appressed villous on the lower ½, basal margins densely villous, the hairs less than 0.5 mm long, apex acute, usually short-awned, the awns 0.5–3.5 mm long; paleas 2.7–3 mm long, pubescent between the veins on the proximal ½, apex obtuse; anthers 1.4–1.6 mm long, yellowish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia pubigluma* is endemic to Mexico and has been reported in Chihuahua, Coahuila, Nuevo León, and Tamaulipas (Valdés Reyna, 2015). *Muhlenbergia pubigluma* primarily occurs on calcareous slopes and flats within oak–pinyon–juniper woodlands at 1,800–3,400 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

**254. *Muhlenbergia purpusii* Mez, Repert. Spec. Nov. Regni Veg. 17(13–18): 214. 1921.**

Caespitose perennial. Culms 25–60 cm tall, erect, pubescent below the nodes, the nodes all basal, terete, usually 1 node

per culm; internodes scabrous and pubescent. Sheaths 1–20 cm long, shorter than the internodes, pubescent to hirsute, sheaths rounded, brownish with age below; ligules 4–10 mm long, membranous above and firm and brownish below, decurrent, margins puberulent and wider than  $\frac{1}{2}$  the adjacent blade width, apex acuminate; blades 5–13 cm long, 0.7–1.8 mm wide, flat or folded, falcate, puberulent to hirsute above and below, the hairs about 0.1 mm long, margins scabrous. Panicles 7–25(30) cm long, 1–10 cm wide, loosely contracted to open, ovate to pyramidal, purplish; primary branches 2–8.5 cm long, capillary, ascending, appressed or spreading to  $50^\circ$  from the rachises; pedicels (2)4–14 mm long, mostly longer than the spikelets, flexuous, glabrous and smooth. Spikelets 2.4–3.2 mm long, purplish; glumes 0.7–1.1 mm long, less than  $\frac{1}{2}$  as long as the lemma, obscurely 1-veined, puberulent on upper  $\frac{2}{3}$ , apex obtuse to acute often erose; lemmas 2.3–3.1 mm long, lanceolate, purplish, short pilose, the hairs 0.1–0.2 mm long, callus short pilose, apex acute, entire to minutely bifid, awned, the awn 10–20 mm long, flexuous; paleas 2.4–3.2 mm long, slightly longer than the lemma, short pilose between the veins, apex acute; anthers 1.6–2 mm long, purplish. Caryopsis 1–1.2 mm long, fusiform to ovoid, brownish.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia purpusii* occurs on calcareous-derived soils primarily on gypsum flats, usually on the sides of sink holes, rock outcrops, roadsides, and slopes with pinyon-juniper woodlands at 1,240–1,900 m. This species is reported in Chihuahua, Coahuila, and San Luis Potosí.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

**255. *Muhlenbergia quadridentata*** (Kunth) Trin., Gram. Unifl. Sesquifl. 194, t. 5b, f. 14. 1824.

Densely tufted perennial. Culms 20–70 cm tall, erect, mostly glabrous below the basal nodes, flattened, 1 node per culm; internodes mostly scabrous. Sheaths 10–30 cm long, shorter than the internodes, scabrous to smooth; basal sheaths densely pubescent to glabrous abaxially, smooth and shiny adaxially, becoming flat and usually not spirally twisted with the age; ligules 2–8 mm long, membranous to hyaline above, firm and often brownish with evident veins near the margins below, decurrent, apex acuminate often lacerate; blades 5–15 cm long, 0.6–2 mm wide, flat or usually tightly involute, scaberulous below, short-spiculate and often villous above, the hairs 0.2–0.5 mm long, usually appressed, the spicules shiny to whitish. Panicles 5–20 cm long, 0.5–2 cm wide, narrow, loosely contracted, interrupted below, mostly plumbeous; primary branches 0.5–5(6) cm long, appressed and ascending to spreading to  $30^\circ$  from the rachises; central axis flattened with 2 ribs, scabrous; pedicels 0.5–2 mm long, shorter than the spikelets, scabrous. Spikelets 3.4–4.7 mm long, mostly plumbeous; glumes 1.8–4 mm long, shorter to almost as long as the floret, unequal, mostly greenish-plumbeous, scabrous, usually with few short hairs below; lower glumes 1.5–2.5(3) mm long, 1-veined, apex obtuse to acute, often with 2 small teeth; upper glumes (3)3.2–4 mm long, 3-veined, apex truncate, obtuse or acute, often with 3 or 4 small teeth, the teeth

less than  $\frac{1}{6}$  the length of the glumes; lemmas 3–4.7 mm long, lanceolate, terete, usually awned, greenish-plumbeous to mottled-plumbeous, sparsely pilose near base and margins on lower  $\frac{1}{2}$ , apex acuminate, scabrous, unawned, mucronate or with an awn 1–20 mm long, flexuous, scabrous, greenish-plumbeous; paleas 2.8–4.3 mm long, shorter than the lemma, pilose on the proximal  $\frac{1}{2}$ ; anthers 1–2.5 mm long, purple. Caryopsis 1.8–2 mm long, fusiform, brownish.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia quadridentata* occurs on open to forested slopes derived from calcareous and volcanic rocks and is associated with *Pinus* spp., and *Quercus* spp. at (1,900)2,500–4,100 m; it occurs throughout Mexico in the higher mountains and also found in Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20038, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US).

**256. *Muhlenbergia ramulosa*** (Kunth) Swallen, Contr. U.S. Natl. Herb. 29(4): 205. 1947.

FIGURE 174

Annual; delicate, slender, often purplish. Culms (3)5–25 cm tall, erect or geniculate, branched at the base, glabrous. Sheaths glabrous or scabrous; ligules 0.2–0.5 mm long, hyaline, truncate, ciliate, without lateral lobes (auricles); blades 5–30 cm long, 0.8–1.2 mm wide, flat or involute, glabrous to puberulent. Panicles (1)2–9 cm long, 0.6–2.5 cm wide, ovoid, sparsely flowered; branches (0.5)1–3.2 cm long, ascending to spreading (open) or closely appressed; pedicels 1–3 mm long, glabrous or scabrous, rigid. Spikelets 0.8–1.3 mm long, erect; glumes 0.4–0.7 mm long, equal, 1-veined, glabrous, whitish, obtuse or subacute, awnless; lemmas 0.8–1.3 mm long, oval, with green spots, inflated at maturity, glabrous or appressed-pubescent on margins and mid-vein, apex acute, awnless; palea 0.7–1.3 mm long, oval; anthers 0.2–0.3 mm long, purplish; Caryopsis 0.5–1 mm long, ellipsoid, brownish to purplish.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia ramulosa* occurs in open pine-oak and tropical forests at elevations of 1,620–2,680 m. It ranges from the United States to throughout Mexico, Central America, and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 12.1 mi NE of El Vergel on Hwy 24, SW of Parral, 2000 m, P.M. Peterson & Annable 4064 (ENCB, US); 18.7 mi N of San Juanito on road to Creel, 2335 m, Y. Herrera, P.M. Peterson & Annable 958 (CIIDIR, US); 16 mi SW of El Vergel on Hwy 24, Río Green, 2200 m, P.M. Peterson & Annable 4074 (US); Río Green, on road from El Vergel to Cienega Prieta, Correll 22902 (US); 45 mi W of Balleza on road towards Guachochi, 2560 m, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13550 (US); 43.5 km W of Balleza and 51.6 km E of Guachochi, 2320 m, P.M. Peterson, Annable & Valdés-Reyna 10763 (US). **Batopilas:** N of Quirare, 2350 m, Bye 6960 (TAES). **Bocoyana:** Cabecera de la cañada de Recogoata, 2400 m, B. Tab V. 28-A, 45 (MEXU); 18.7 mi S of San Juanito on road to Creel, 2200

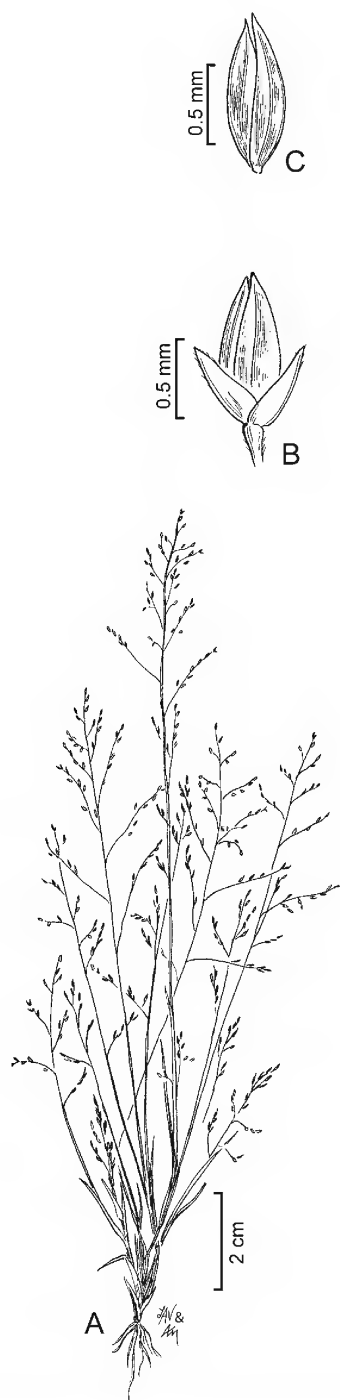


FIGURE 174. *Muhlenbergia ramulosa*. A. Habit. B. Spikelet. C. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

m, P.M. Peterson, Annable & Y. Herrera 8000 (US). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 1315 (TAES); Sánchez, Oct 1910, Hitchcock 7661 (US). **Casas Grandes:** 3 mi W of Cuesta Blanca, W of Casas Grandes, 2073 m, Reeder & C. Reeder 3219 (US). 3 mi S of Cuesta Blanca, W of Casas Grandes, Reeder & C. Reeder 3538 (US). **Chihuahua:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, P.M. Peterson & Annable 12562 (US). **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20040, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US); west slope of Sierra Mohinora, 13 Sep 2006, 3008 m, P.M. Peterson 20053, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guachochi:** Km 85 carr. [hwy] Balleza-Guachochi, 2300 m, M.E. Siqueiros 1606 (MEXU); Cusarare, S of Creel, 2200 m, Bye 7063 (TAES); 6.3 mi S of Cusarare on rd to Guachochi, 2420 m, P.M. Peterson & Annable 5887 (US); 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, P.M. Peterson, Annable & Y. Herrera 8077 (US); 18 mi E of Guachochi on Mex 127 towards Balleza, 2680 m, P.M. Peterson, Annable & Y. Herrera 8081 (US); 19.3 km E of Guachochi, 26 Sep 1988, 2300 m, P.M. Peterson & Annable 5928 (US); Norogachic, 2320 m, E. Palmer 404b (US); 1885, E. Palmer 4b (US), holotype; 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, P.M. Peterson, Annable & Valdés-Reyna 10790 (US). **Guerrero:** 4.5 mi W of Tomochic on Hwy 16, 2200 m, P.M. Peterson & Annable 4543 (TAES, US); 22 mi SW of La Junta on rd to Creel, 2200 m, P.M. Peterson & Annable 5836 (US); 24 mi SW of La Junta on road to Creel, 2000 m, P.M. Peterson & Annable 5854 (US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 2200 m, P.M. Peterson & R.M. King 8213 (US). **Madera:** 12 mi NW of Madera, 2285 m, Reeder & C. Reeder 2649 (SLPM, US); 11 mi N of Long, 2500 m, Reeder & C. Reeder 2686 (US). **Namiquipa:** 45 mi S of Ignacio Zaragoza, 2200 m, P.M. Peterson & R.M. King 8169 (US). **Ocampo:** Parque Nacional Cascada de Basaseachic, 1620 m, R. Fierros 1694 (MEXU); Parque Nacional Cascada de Basaseachic, 1700 m, M.E. Siqueiros 201 (MEXU); Parque Nacional Cascada de Basaseachic, 2100 m, Tenorio & R. Torres 3777c (MEXU); Approx. 10 mi E of Basaseachic on Hwy towards La Junta, 2110 m, P.M. Peterson & Annable 12542 (US). **Riva Palacio:** Cumbres de Majalca, 21.5 mi W of Hwy 45, 2000 m, P.M. Peterson & Annable 4522 (TAES, US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, P.M. Peterson & Annable 5793 (US).

257. *Muhlenbergia repens* (J. Presl) Hitchc., Fl. Calif. 1: 111. 1912

FIGURE 175A-D

Perennial; with shining, creeping, scaly rhizomes. Culms 5–42 cm tall, decumbent near base, forming dense mats, freely branching above, glabrous below the nodes; internodes mostly glabrous below, lightly nodulose roughened just below the inflorescence. Sheaths 0.6–3.4 cm long, shorter or longer than the internodes, glabrous, margins hyaline; ligules 0.1–1(1.8) mm long, membranous, decurrent, apex truncate, occasionally

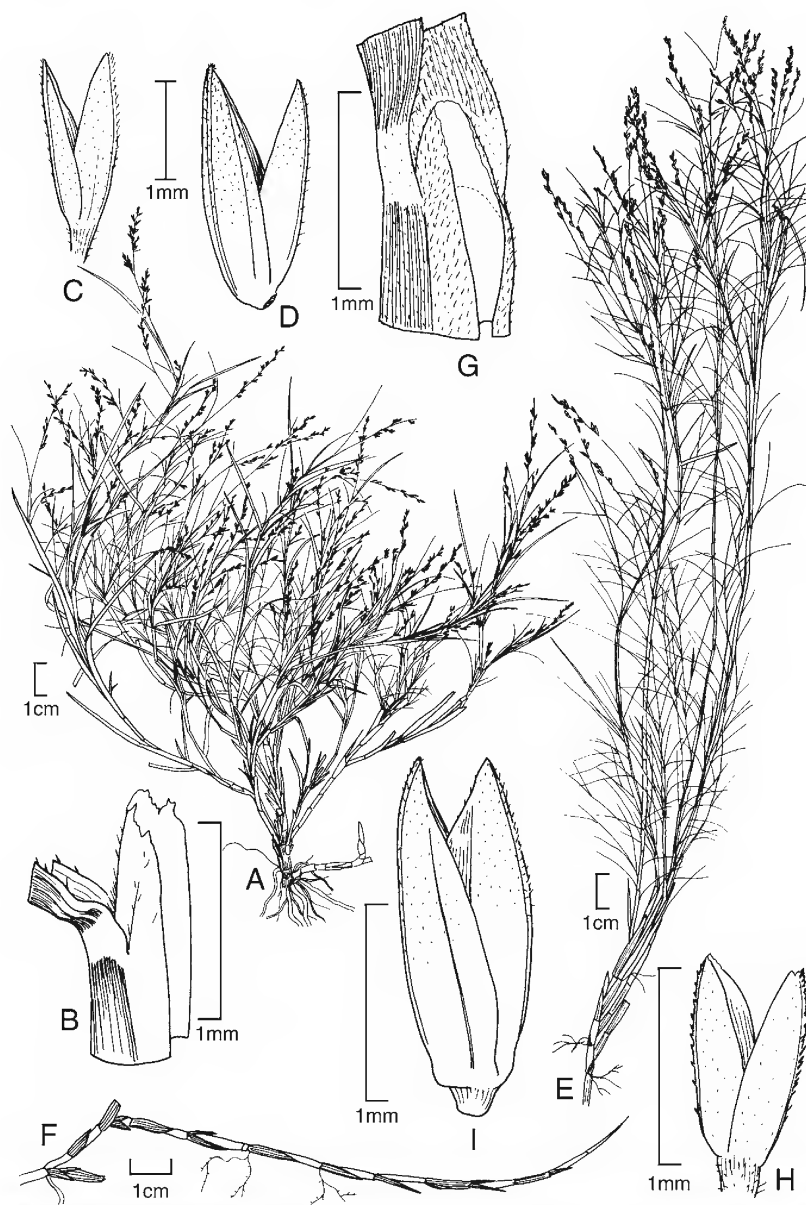


FIGURE 175. *Muhlenbergia repens*. A. Habit. B. Ligule. C. Glumes. D. Floret. *Muhlenbergia utilis*. E. Habit. F. Rhizome. G. Ligule. H. Glumes. I. Floret. Drawn by Cathy Pasquale for Smithsonian Institution, Department of Botany.

lacerate; blades 0.4–6 cm long, 0.5–1.4 mm wide, involute, somewhat arcuate-spreading, mostly glabrous below and scaberrulous above. Panicles 1–9 cm long, 0.1–0.6 cm wide, narrow, contracted, loosely flowered, usually included at the base in the uppermost leaf sheath; primary branches 0.2–3 cm long, usually closely appressed, rarely diverging to 40° from the rachises;

pedicels 0.2–3.6 mm long, minutely setose. Spikelets 2.6–4.2 mm long, occasionally 2-flowered; glumes 1.1–3.6 mm long,  $\frac{1}{2}$  to as long as the lemma, subequal, usually 1-veined, occasionally 2- to 3-veined, light green, apex acute; lemmas 2.6–3.2(4.2) mm long, lanceolate, unawned or mucronate, dark greenish or mottled, glabrous or with minute appressed pubescence along the margin

and base, the hairs less than 0.1 mm long, apex acute to attenuate and tapering, scaberulous, the mucro 0.1–0.8 mm long; paleas 2.1–3.3 mm long, lanceolate, glabrous to scaberulous, apex acute; anthers 0.7–1.4 mm long, yellow to purplish. Caryopsis 1.1–1.5 mm long, ellipsoid to ovoid, brownish.  $2n = 60$ , 70–72.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia repens* occurs in sandy meadows, canyon bottoms, calcareous rocky flats, gypsum flats, rolling slopes, and roadsides associated with oak–pinyon–juniper woodlands at 100–3,120 m; it occurs in southern Utah, southern Colorado, eastern Arizona, New Mexico, and west Texas and throughout México.

**SPECIMENS EXAMINED.** MEXICO. **Buenaventura:** 15 mi W of Flores Magón, 1829 m, R. Guzmán 4933 (MEXU). **Camargo:** Col. Encinillas de la Laguna, 1500 m, Valdés-Reyna VR-407 (ENCB). **Carichi:** Sánchez, 12 Oct 1910, Hitchcock 7710 (US). **Casas Grandes:** 18 mi W of Col. Juárez, 2073 m, Reeder & C. Reeder 1219 (ENCB). **Cuahtémoc:** 16 km W of Cuahtémoc on Hwy 16, 2100 m, P.M. Peterson & Annable 4056 (US); 10 mi W of Cuahtémoc on Hwy 16, P.M. Peterson & Annable 4057 (US); 5 mi N of LAug at the edge of small lake, 2375 m, Reeder & C. Reeder 2683 (MEXU); 5.5 mi W of Cuahtémoc, 23 Sep 1988, 2100 m, P.M. Peterson & Annable 5822 (US); 11 mi W of Cuahtémoc, Reeder & C. Reeder 4598 (US). About 12 mi W of Cuahtémoc, 2285 m, Reeder & C. Reeder 2619 (US). **Chihuahua:** La Campana, 10 km W carr. [hwy] Panama, 1700 m, Valdés-Reyna VR-243 (TAES); Chihuahua, 1700 m, LeSueur 050 (US). **Guachochi:** 3.7 km N of San Juanito on road to Creel, near km 53 marker, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5863 (US). **Guerrero:** Basuchil, NW de La Junta, 2000 m, I.W. Knobloch 660 (TAES); 17.3 mi W of La Junta on road to Tomochic, 4 Sep 1985, P.M. Peterson & Annable 4052A (US). **Janos:** San Pedro River, Mexican boundary line, E.A. Mearns 1128 (US). **Madera:** 2 mi N of Madera, 2165 m, Reeder & C. Reeder 2644 (SLPM). **Riva Palacio:** 11.3 km W of Nuevo Majalca, 25.7 km W on Hwy 45, 1800 m, P.M. Peterson & Annable 5795 (US).

**258. *Muhlenbergia richardsonis* (Trin.) Rydb., Bull. Torrey Bot. Club 32(11): 600. 1905.**

Perennial; rhizomatous, not caespitose, often mat-forming. Culms 5–30 cm tall, decumbent, geniculate, or erect; internodes usually nodulose (occasionally smooth) for most of their length, puberulent or nodulose below the nodes. Sheaths shorter or longer than the internodes, glabrous; ligules 0.8–3 mm long, membranous, acute to truncate, erose; blades 0.4–6.5 cm long, 0.5–4.2 mm wide, flat or involute, straight or arcuate-spreading, glabrous abaxially, hirtellous adaxially. Panicles 1–15 cm long, 0.1–1.7 cm wide, exserted, narrow or spikelike, rachises usually concealed by the branches; primary branches 0.4–5 cm long, usually closely appressed at maturity, rarely diverging up to 20° from the rachises; pedicels 0.2–2 mm long, setulose. Spikelets 1.7–3.1 mm long, occasionally with 2 florets. Glumes subequal, 0.6–2 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the lemmas, green,

1(2)-veined, acute, sometimes mucronate, mucros less than 0.2 mm long; lemmas 1.7–2.6(3.1) mm long, lanceolate, dark greenish, plumbeous, or mottled, glabrous, apex scaberulous, acute to acuminate, sometimes mucronate, mucros to 0.5 mm long; paleas 1.2–2.4(2.9) mm long, lanceolate, acute; anthers 0.9–1.6 mm long, yellow to purplish. Caryopses 0.9–1.6 mm long, narrowly ellipsoid, brown.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia richardsonis* grows in open sites in alkaline meadows, prairies, sandy arroyo bottoms, talus slopes, rocky flats, and the shores of rivers. It occurs from the Yukon Territory to Quebec south to northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. **Chihuahua. Cuahtémoc:** 10 mi W of Cuahtémoc on Hwy 16, 5 Sep 1985, 2100 m, P.M. Peterson & Annable 4056, 4057 (US).

**259. *Muhlenbergia rigens* (Benth.) Hitchc., J. Wash. Acad. Sci. 23: 453. 1933.**

FIGURE 176

Densely caespitose perennial. Culms (35)50–150 cm tall, erect, rounded and up to 5 mm thick near base, mostly glabrous below the nodes; internodes glabrous. Sheaths 3–45 cm long, longer than the internodes, glabrous to scaberulous, rounded to keeled and chartaceous near base; ligules 0.5–2(3) mm long, somewhat firm, decurrent, apex truncate, usually minutely ciliate; blades 10–50 cm long, 1.5–6 mm wide, flat or involute, stiff, glabrous abaxially and scabrous between the prominent ridges adaxially. Panicles 15–60 cm long, 0.5–1.2 cm wide, narrow, elongate, contracted and spikelike, densely flowered, often interrupted below, grayish-green; primary branches 0.2–4 cm long, ascending and tightly appressed; pedicels 0.2–3 mm long, mostly shorter than the spikelets, hirsute. Spikelets 2.4–4 mm long, erect, grayish-green; glumes 1.8–3.2 mm long, subequal, shorter than the lemma, scabrous to scaberulous, 1-veined, apex acute or obtuse, occasionally acuminate or notched, mucronate or short-awned, the awn to 1.7 mm long; lemmas 2.4–4 mm long, lanceolate, unawned, rarely mucronate, glabrous below and scabrous above, short appressed pubescence on the calus, midvein, and margins on the proximal  $\frac{1}{6}$ , the hairs up to 0.4 mm long, apex acute or obtuse, the mucro to 0.9 mm long; paleas 2.3–3.8 mm long, lanceolate, glabrous below and scabrous above, apex mostly acute; anthers 1.3–1.8 mm long, yellow to purple. Caryopsis 1.8–2.2 mm long, fusiform, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia rigens* occurs in sandy washes, gravelly canyon bottoms, rocky drainages, and moist, sandy slopes often along small streams associated with pinyon–juniper woodlands at 90–2,500 m. It ranges from California, Arizona, New Mexico, and Texas to northcentral Mexico in Aguascalientes, Baja California, Baja California Sur, Chihuahua, Durango, Jalisco, Michoacán, Puebla, Sonora, and Zacatecas.





FIGURE 176. *Muhlenbergia rigens*. A. Habit. B. Inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7686 (US). **Casas Grandes:** W of Casas Grandes, 5 mi S of Hernández, 2200 m, *Reeder & C. Reeder* 3511 (ENCB, US); Rancho Palanganas, 2200 m, *A. González* 110 (MEXU); Valle de las Cuevas S Ejido Ignacio Zaragoza, 1760 m, *Tenorio & Romero* 1707 (CHAPA). W of Casas Grandes, 5 mi S of Hernández, 2200 m, *Reeder & C. Reeder* 3508 (CHAPA, US). **Cuahtémoc:** 16 mi W of Cuauhtémoc, 2400 m, *Reeder & C. Reeder* 3479 (CHAPA, US); 18 mi W of Cuauhtémoc, 2400 m, *Reeder & C. Reeder* 4589 (US); 25 mi W of Cuauhtémoc, *Reeder & C. Reeder* 4231 (US); 5.6 mi N of Cuauhtémoc on Mex 23, 14 Sep 1989, 2120 m, *P.M. Peterson & R.M. King* 8110 (US); 18.5 km W of Cuauhtémoc on Hwy 16, 23 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5818 (US). **Chihuahua:** 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12569 (US); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, *M.E. Siqueiros* 339 (MEXU); Streams near Chihuahua, 1950 m, *C.G. Pringle* 417 (US), Isotype; Along aqueduct, 1700 m, *Hitchcock* 7770, 7773 (US); W of Chihuahua, 1800 m, *LeSueur* 073 (US); Canyon de St. Diego, Chih. 1900 m, *C.V. Hartman* 803 (US); 12 mi N of Chihuahua on road to Cd. Juarez, 1700 m, *Reeder & C. Reeder* 3486 (US); *Soderstrom* 927, 928, 929 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12567 (US); 17.5 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, *P.M. Peterson & Annable* 12599 (US). **Gómez Farías:** Near Gómez Farías, 1900 m, *A.A. Beetle* M-7944 (MEXU). **Guachochi:** Just N of Guachochi (1 km), 26 Sep 1988, 2500 m, *P.M. Peterson & Annable* 5915 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 1891 m, *P.M. Peterson & P. Catalán* 17546 (US). **Guerrero:** About 5 mi SE Guerrero, 2130 m, *Reeder & C. Reeder* 2623 (ENCB); Miñaca, 13 Oct 1910, *Hitchcock* 7748, 7749 (US). **Hidalgo del Parral:** 1 mi S of Parral on road to Mexico city, *Soderstrom* 830 (US); 21 km W of Parral and approx. 8 km N on dirt road to Torrenocillo, 1900 m, *P.M. Peterson & Annable* 5970 (US). **Madera:** Sierra Madre Mts, Marsh Lake, Sep 1903, *M.E. Jones* s.n. (US) type fragm.; near Col. García in the Sierra Madre, 21 Sep 1899, *C.H.T. Townsend & C.M. Barber* 341 (US), holotype; Arroyo de La Quinta, ejido El Long, 2100 m, *O. Bravo* 1868-a (CIIDIR). **Matamoros:** 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 1900 m, *P.M. Peterson, Annable & Valdés-Reyna* 10870 (US). **Moris:** SW Chihuahua, 1900 m, *E. Palmer* 1, 21 (US). **Ocampo:** Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12530 (US); Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Tenorio & R. Torres* 4488 (MEXU, US); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8238 (US). **Riva Palacio:** Canyon de Majalca, 1850 m, *Pennell* 19264 (US); 32.3 km W of Mex 45, and ca. 0.8 km E of Col. Cumbres de Majalca, 7 Sep 1989, 2180 m, *P.M. Peterson, Annable & Y. Herrera* 7975 (US).

**Uruáchi:** 16 mi W of Maycoba on Hwy 16 towards Yécora, 1520 m, *P.M. Peterson & J. Cayouette* 15348 (US).

260. *Muhlenbergia rigida* (Kunth) Kunth, Révis. Gramin. 1:63. 1829.

FIGURE 170A–G

Densely caespitose perennial. Culms 40–100 cm tall, stiffly erect, glabrous to scaberulous below the basal, terete nodes; usually 1 node per culm; internodes mostly glabrous. Sheaths 2–30 cm long, longer than the internodes, glabrous to scaberulous, rounded near base; ligules (1)3–12(15) mm long, often lacerate, firmer below, strongly decurrent; apex obtuse to acute; blades 12–35 cm long, 1–3 mm wide, flat or involute, not falcate, glabrous to scaberulous below and scaberulous to hirsutulous above. Panicles (4)10–35 cm long, (2)3–5(15) cm wide, loosely contracted to open and lax, purplish; primary branches 0.4–10 cm long, sometimes capillary, ascending and spreading to 80° from the rachises; pedicels 1–10 mm long, mostly longer than the spikelets. Spikelets 3.5–5 mm long, purplish; glumes 1–1.7(2) mm long, about equal, 1-veined, unawned, apex obtuse to subacute, sometimes hirsutulous, rarely mucronate; lemmas 3.5–5 mm long, narrow lanceolate, scaberulous to scabrous, purple, awned, callus with hairs to 0.5 mm long, apex acuminate, the awn (5)10–22 mm long, flexuous; paleas 3.5–5 mm long, narrow lanceolate, purple, scaberulous, apex acuminate; anthers 1.7–2.3 mm long, purplish. Caryopsis 2–3.5 mm long, fusiform, brownish.  $2n = 40, 44$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia rigida* occurs on rocky slopes, ravines, and sandy, gravelly slopes derived from granitic and calcareous substrates associated with oak–pinyon–juniper woodlands at 1,200–2,500 m. It ranges from southeastern Arizona and southwestern New Mexico to southwestern Texas and throughout Mexico to South America in Andean Ecuador, Peru, Bolivia, and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Entre [between] Jumiles & Felipe Angeles, 1360 m, *S. González & J.M. Peña* 398 (TAES). **Balleza:** 69.2 km E of Guachochi and 25.7 km W of Balleza, 26 Sep 1988, 2100 m, *P.M. Peterson & Annable* 5941 (US); 7.2 mi SW of El Vergel on Mex. Hwy 24, SW of Parral, 2200 m, *M.E. Siqueiros* 1568 (MEXU); 14.8 mi NE of El Vergel, 2100 m, *M.E. Siqueiros* 1569 (MEXU); 11 mi SE of Balleza on road to Parral, 1800 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13530 (US); 24.9 km SE of Balleza and 22.5 km N of Hwy 24, W of Parral, 26 Sep 1988, 1900 m, *P.M. Peterson & Annable* 5949 (US); 16.1 km W of Balleza and 77.9 km E of Guachochi, 1990 m, *P.M. Peterson, Annable & Valdés-Reyna* 10742 (US); 24.2 km W of Balleza on Mex 127 towards Guachochi, 13 Sep 1989, 2380 m, *P.M. Peterson, Annable & Y. Herrera* 8089 (US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20030, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Batopilas:** Hacienda San Miguel, near Batopilas, 2100 m, *E. Palmer* 13 (TAES, US); N of Quirare, 2350 m, *Bye* 2798 (TAES). **Bocoyna:** 24.7

mi N of San Juanito on road towards Cuauhtémoc, 5 Sep 2008, 2233 m, *P.M. Peterson & J.M. Saarela* 22027 (US); Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V. 27* (MEXU). **Buenaventura:** 15 mi W of Flores Magón, 1829 m, *R. Guzmán*, 4934, 4937, 4939 (MEXU). **Casas Grandes:** Rancho Palanganas, 2200 m, *R. Fierros* 126 (MEXU). **Cuauhtémoc:** 10.6 km W of Cuauhtémoc on Hwy 16, 2000 m, *P.M. Peterson & Annable* 5817 (US); 5.5 mi W of Cuauhtémoc, 2100 m, *Reeder & C. Reeder* 2617 (TAES); 20.9 km W of Cuauhtémoc on Hwy 16, 23 Sep 1988, 2000 m, *P.M. Peterson & Annable* 5824 (US). **Cusihuiriáchi:** 1 km al NE del rancho de Santiago, 2550 m, *V.M. López* 5 (INEGI). **Chihuahua:** Base de la Sierra de La Campana, 80 km al N de Chihuahua, 1700 m, *Rzedowski* 32307 (SLPM); Km 43 [hwy] carr. Chihuahua–Cd. Cuauhtémoc, 1600 m, *R.G. Reeves & J. Morrow* G-452 (TAES); Hills near Chihuahua, 1800 m, *C.G. Pringle* 926 (US); W of Chihuahua, 1700 m, *LeSueur* 046 (US); 13 mi SW of Chihuahua on road to Cuauhtémoc, *Soderstrom* 919 (US); 33–35 km W of Hwy 45 on road towards Benito Juárez, 2200 m, *P.M. Peterson & Annable* 12555 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson & Annable* 12570, 12571 (US); 6.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1640 m, *P.M. Peterson & Annable* 12579 (US); 16.7 mi W of Hwy 45 on road up Los Prietos Canyon, 2120 m, *P.M. Peterson & Annable* 12591 (US). **Guachochi:** Just N of Guachochi (1 km), 26 Sep 1988, 2500 m, *P.M. Peterson & Annable* 5923 (US); entering Barranca El Cobre, 28.3 km S of Cusarare on road to Guachochi, 25 Sep 1988, 1900 m, *P.M. Peterson & Annable* 5902, 5906 (US); 9 mi S of Guachochi at edge of Barranca Río Green, 2470 m, *P.M. Peterson & J. Cayouette* 15380, 15373 (US); White-tuff volcanic outcrops surrounding Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17683 (CIIDIR, US); Arroyo Baqueachi, at 5 km E of small village, 2004 m, *P.M. Peterson & P. Catalán* 17569 (CIIDIR, US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13566 (US); Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 6 Sep 2008, 1880–1900 m, *P.M. Peterson & J.M. Saarela* 22061 (US). **Guerrero:** 35.4 km SW of La Junta and approx. 74 km N of Creel, 2200 m, *P.M. Peterson & Annable* 5838 (US); 35.4 km SW of La Junta on road to Creel, 23 Sep 1988, 2200 m, *P.M. Peterson & Annable* 5826 (US); km 25 carr. La Junta–Tomochi, 2380 m, *Valdés-Reyna* VR-711 (ENCB); Tomochi, 2 km alrededor del poblado [around the village], 2100 m, *M. Vergara* 148 (MEXU); Carr. San Juanito–La Junta, 17 km, 2000 m, *B. Tab V. 14* (MEXU); Tomochi, 2 km alrededor del poblado, 2100 m, *M. Vergara* 151 (MEXU); 10 km al S de Guerrero, 2000 m, *Valdés-Reyna* VR-672 (TAES); Miñaca, 13 Oct 1910, *Hitchcock* 7747 (US); 40.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 29 Sep 1989, 2390 m, *P.M. Peterson & R.M. King* 8190 (US); 54.3 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8211 (US); 16 km SW of La Junta on road to Creel, 2270 m, *P.M. Peterson* 9616

(US). **Hidalgo del Parral:** 5 km al E de Parral, 1800 m, *S. Ojeda s.n.* (INEGI); Cerro Borregos, 1930 m, *S. Ojeda s.n.* (INEGI); 5 km al S de Parral, 2000 m, *E. Aldrete s.n.* (INEGI); 21 km W of Parral and approx. 3.2 km N on dirt road to Torrenocillo, 26 Sep 1988, 2000 m, *P.M. Peterson & Annable 5963, 5971* (US); 33.8 km W of Parral on Hwy 24 towards El Vergel, 26 Sep 1988, 2000 m, *P.M. Peterson & Annable 5956* (US); Minas Nuevas, about 8 mi NW of Parral, *Correll 22742* (US); 2 mi E of Parral on road to Juárez, 3 Oct 1959, *Soderstrom 855* (US). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, *P.M. Peterson & R.M. King 8159* (US). **Jiménez:** Sta. Eulalia Mts, C.G. *Pringle 401* (US). **Madera:** 10 km al N de Madera, 2100 m, *Valdés-Reyna VR-675* (ENCB). **Matachi:** 23.3 km SE of Madera on Mex 16 to La Junta, 2190 m, *P.M. Peterson & R.M. King 8177* (US); 71.7 km SE of Madera on Mex 16 and 1.6 km S of Temosachici, 29 Sep 1989, 2090 m, *P.M. Peterson & R.M. King 8187, 8188* (US). **Matamoros:** 19.3 km S of Villa Matamoros on Hwy 45 to Durango, 27 Sep 1988, 1800 m, *P.M. Peterson & Annable 5985* (US); 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, *V. Jaramillo, G. Villegas & A. Miranda 2/10* (MEXU); 19.3 km S of Villa Matamoros on Mex 45 to Durango, 1910 m, *P.M. Peterson & R.M. King 8261* (US); 84.6 km SE of Villa Matamoros and 1.6 km N of Ejido Revolución on Mex 45, 1900 m, *P.M. Peterson, Annable & Valdés-Reyna 10876* (US). **Moris:** Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable 12518, 12519* (US). **Riva Palacio:** Col. Cumbres de Majalca, approx. 32.2 km W of Hwy 45 N of Chihuahua, 2100 m, *P.M. Peterson & Annable 5805* (US); 2.7 km W of Nuevo Majalca, 17.2 km W of Hwy 45, N of Chihuahua, 22 Sep 1988, 1700 m, *P.M. Peterson & Annable 5776* (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 7 Sep 1989, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7970* (US); Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *C. Yen & E. Estrada 8612* (ENCB); Lookout approximately 1.6 km E of Col. Cumbres de Majalca and 30.6 km W of Hwy 45, N of Chihuahua, 23 Sep 1988, 2150 m, *P.M. Peterson & Annable 5816, 5817* (US); 17.7 km W of Nuevo Majalca on road to Cumbres de Majalea, Parque Nacional, 22 Sep 1988, 2000 m, *P.M. Peterson & Annable 5782, 5783* (US); 32.3 km W of Mex 45, and ca. 0.8 km E of Col. Cumbres de Majalca, 7 Sep 1989, 2180 m, *P.M. Peterson, Annable & Y. Herrera 7977* (US). **San Francisco del Oro:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna 10711* (US); 10 km al E del retén de policía [police checkpoint], carr. Parral–El Vergel, 2450 m, *M. Sequeiros 1545* (MEXU). **Santa Bárbara:** Ejido Buenavista, 1950 m, *S. Aguirre 2055* (MEXU). **Temósachi:** 2.5 km al W de San Juan, 1800 m, *S. Aguirre 25* (INEGI).

**261. *Muhlenbergia robusta*** (E. Fourn.) Hitchc., N. Amer. Fl. 17(6): 462. 1935.

Caespitose perennial. Culms 100–230(300) cm tall, erect, compressed-keeled near base, glabrous to sometimes pubescent

below the nodes; internodes glabrous. Sheaths 15–70 cm long, longer than the internodes, glabrous, becoming brownish below, sometimes shredded; sheath auricles present, (1)2–4(10) cm long, linear subulate to broadly triangular, longer above, straight or twisted, firm below; ligules 2–10(12) mm long, membranous, lacerate throughout; blades 40–100 cm long, 4–7 mm wide, folded sometimes involute toward tip, scaberulous above and below, the margins and keel saw-toothed. Panicles 30–80 cm long, (2)3–8 cm wide, narrow to loosely contracted, greenish-gray to silvery gray or purplish; primary branches 1–15(17) cm long, naked on the lower ¼, ascending and closely appressed to spreading up to 40° from the rachises; pedicels 0.3–1.1 mm long, shorter than the spikelets, erect, scaberulous; central axis prominently ribbed, scabrous. Spikelets (1.8)2–3(3.2) mm long, erect, greenish-gray or purplish; glumes 1.8–3.2 mm long, usually longer than the floret, subequal, narrowly oblong to elliptic, veinless to indistinctly 1-veined, hyaline to greenish-gray, glabrous to scaberulous, apex acute to obtuse occasionally erose; lemmas 1.7–2.6 mm long, linear-oblong, unawned or rarely mucronate, greenish to yellowish-brown, glabrous or pubescent with scattered hairs on lower ½, the hairs up to 0.3 mm long, callus glabrous or with few hairs, apex acute, the mucro when present up to 1 mm long; paleas 1.7–2.6 mm long, glabrous to sparingly pilose between the veins on the lower ½, apex acute; anthers 1.1–2 mm long, purplish. Caryopsis 1.2–1.7 mm long, fusiform, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia robusta* occurs in mountainous areas from Sinaloa and Chihuahua south to Chiapas and Central America; found on rocky slopes, along barrancas (canyons), in pine and pine-oak forests, and in tropical deciduous forests at 850–3,000 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

**262. *Muhlenbergia schmitzii*** Hack., Ann. K. K. Naturhist. Hofmus. 17: 255. 1902.

FIGURE 163E–H

Caespitose annual; stout, appearing perennial. Culms 30–80 cm tall, scabrous below nodes, erect, little branched. Sheaths scabrous to apex, margins membranous, light brownish; ligules 2–3 mm long, membranous, apex obtuse to truncate, erose to deeply incised or toothed, margins entire; blades 5–20 cm long, 1.6–5 mm wide, flat, scabrous to glabrous. Panicles 12–36 cm long, 3.2–14 cm wide, spreading, elongated; branches 1.2–8 cm long, 1 occasionally 2 per node, ascending or open; pedicels 1–1.5 mm long, strong, erect. Spikelets 2.5–3.4 mm long, wide, dorsally flattened, ascending, appressed along branches; glumes 1.3–2 mm long, subequal, scabrous, sometimes short-pubescent near apex and margins, 1-veined, awned, the awns 0.5–0.8 mm long; lower glumes ovate-lanceolate, acuminate; upper glumes oblong, abruptly acuminate, apex 2- to 3-lobed to tridentate; lemmas 2.5–3.2 mm long, oblong-ellipsoid, brown-yellowish with age,

veins prominent, sometimes dorsally flattened, silky-pubescent, appressed on midvein, hairs 0.3 mm long, apex entire to toothed, mucronate, the mucro 0.3–0.5 mm long; paleas 2.6–3.4 mm long, oblong-ellipsoid, a little longer than lemma, glabrous, apex bilobate, the lobes 0.3 mm long, acute; anthers 0.9–1.6 mm long, purplish changing to brown-yellowish with age. Caryopsis 1–2 mm long, oblong, compressed, straw-colored.  $n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia schmitzii* occurs in humid areas in pine-oak forests at elevations of 1,500–2,460 m. It is endemic to Mexico and found in Chihuahua, Hidalgo, México, and Michoacán.

*Muhlenbergia schmitzii* is easily confused with *M. flavida* and *M. strictior*, and can be distinguished in having tall culms (30–80 cm tall), blades longer and wider (5–20 cm long and 1.6–5 mm wide), mucronate lemmas (mucro 0.3–0.5 mm long) rather than short-awned, and longer anthers (0.9–1.6 mm).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** Sierra Mohinora, about 3 mi S of La Rocha, 2250 m, *Correll & Gentry* 23228 (ENCB, US). **Madera:** Guayanopa Canyon, Sierra Madre, Sep 1903, 2000 m, *M.E. Jones* 7316 (US), isotype.

263. *Muhlenbergia scoparia* Vasey, Contr. U.S. Natl. Herb. 1(8): 283. 1893.

FIGURE 165A–E

Densely caespitose perennial. Culms 55–90 cm tall, glabrous to scaberulous, nodes and internodes glabrous. Sheaths basal, compressed-keeled, glabrous and scaberulous near the collar, undulate when mature, brown-reddish, fibrose; ligules 8–16 mm long, membranous, auricles absent; blades 25–50 cm long, 1–4.5 mm wide, flat or folded, toothed at the apex, scabrous. Panicles 20–30 long, 1.5–5 cm wide, somewhat open, the ascending to arching branches narrow, interrupted into groups along the rachis, light green to brown-reddish, rachis scabrous, with prominent ribs; primary branches 3.5–10 cm long, naked at base; secondary branches 1–5.5 cm long; pedicels of lateral spikelets 0.6–1.2 mm long, up to 3 mm long in terminal spikelets, scabrous. Spikelets 1.5–2.2 mm long; glumes shorter than the florets, subequal, mucronate, hyaline, veinless to 1-veined, glabrous to scaberulous apex acute; lower glumes 0.8–1 mm long; upper glume 1–1.5 mm long, the mucro to 1 mm long; lemmas 1.5–2 mm long, acuminate, awned, glabrous to scaberulous dorsally, the hairs 0.5–0.7 mm long, rigid, on proximal margins, the awn 8–15 mm long, emerging a little below of apex; paleas 1.5–2 mm long, glabrous; anthers 0.5–0.7 mm long.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia scoparia* occurs in oak forests at elevations of 1,540–2,000 m. It is endemic to Mexico and is found in Chihuahua, Durango, Jalisco, Michoacán, Nayarit, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Batopilas, 2000 m, *C.G. Pringle* 2350 (ENCB, MEXU); Batopilas, 2000 m, *E. Palmer* 766 (TAES); Potrero La

Sierra, 4 km Pte Carr. [hwy] Panamericana, 7 Sep 73, bosque de encino [oak forest], 1700 m, *J. Valdés-Reyn* VR-144 (RELC). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela* 22115, 22131 (US); Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela* 22151 (US). **Moris:** Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable* 12520 (US).

264. *Muhlenbergia setifolia* Vasey, Bot. Gaz. 7(8–9): 92. 1882.

Caespitose perennial. Culms 30–85 cm tall, erect, slender, slightly decumbent near base, hirsutulous below the terete nodes, 2–4 nodes per culm; internodes glabrous to hirsutulous. Sheaths 2–13 cm long, shorter than the internodes, glabrous to puberulent, basal sheaths rounded, margins whitish; ligules 4–7(10) mm long, membranous, firm below, decurrent, margins glabrous to puberulent and wider than  $\frac{1}{2}$  the adjacent blade width, apex acuminate, lacerate; blades 5–20(25) cm long, 1–2.5 mm wide, tightly involute to falcate, scaberulous below and scaberulous to hirsutulous above, the hairs less than 0.1 mm long. Panicles 8–20(25) cm long, (2)3–5 cm wide, loosely contracted, ovate; primary branches 0.5–7 cm long, capillary, ascending, appressed or spreading up to 70° from the rachises; pedicels 3–20 mm long, mostly longer than the spikelets, delicate, flexuous, glabrous and smooth. Spikelets 3.5–5.1 mm long; glumes 1.5–2.5 mm long, subequal, thin and hyaline, stramineous to reddish; lower glumes veinless, apex truncate or obtuse, often toothed or notched; upper glumes 1-veined or veinless, apex obtuse to acute often mucronate, the mucro less than 0.7 mm long; lemmas 3.5–5.1 mm long, narrow lanceolate, glabrous, smooth and shining, stramineous to reddish, awned, callus with hairs up to 0.6 mm long, apex acuminate, demarcation of lemma body and awn not evident, the awn 2–7(10) mm long, flexuous; paleas 3.5–5.1 mm long, as long as the lemma, narrow lanceolate, glabrous, apex acuminate; anthers 2–2.6 mm long, greenish. Caryopsis 2.4–3.2 mm long, fusiform, brownish.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia setifolia* grows on calcareous rocky slopes, on rock outcrops, and in desert grasslands associated with oak-pinyon-juniper woodlands at 1,000–2,250 m. It is found in western Texas, New Mexico, and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua.** Chihuahua: Sierra de la Campana, 10 km al W de la [hwy] Carr. Panamericana, 19 Sep 1973, pastizal [pastureland], 1700 m, *J. Valdés-Reyna* VR-325 (RELC). **Juárez:** Santo Domingo, north of Chihuahua, Sierra del Presidio, Desierto Chihuahuense, *I.M. Johnston s.n.* (US). **Temósachi:** Between Yécora and Naicova, 2250 m, *Correll & I.M. Johnston* 21630 (US). **Mpio.?:** Sierra de los Pinos, Dec 1937, *LeSueur* 0215 (US).

265. *Muhlenbergia shepherdii* (Vasey) Swallen, Contr. U.S. Natl. Herb. 29(4): 204. 1947. *Sporobolus shepherdii* Vasey,

Bull. Torrey Bot. Club 14: 8. 1887. *Blepharoneuron shepherdii* (Vasey) P. M. Peterson & Annable, Syst. Bot. 15(4): 519. 1990.

Caespitose annual. Culms 16–40 cm tall, scaberulous to strigose below nodes, slender to quite thick, erect to geniculate-spreading, with many branches near base; internodes 2.2–5 cm long. Sheaths 3.2–9 cm long, usually longer than internodes, glabrous, margins hyaline; ligules 1.4–2.8 mm long, membranous hyaline, apex irregularly toothed to lacerate, occasionally entire, truncate to obtuse, margins entire, decurrent; blades 4–8.5 cm long, 0.8–2 mm wide, flat to slightly involute, short-pubescent above and glabrous to scaberulous below. Panicles 8–18 cm long, 2.7–7 cm wide, open, branches 3–6 cm long, ascending to spreading 20°–70° from the culm axis, often capillary, 1 or 2 per node; pedicels 7–12 mm long, capillary, nodding and reflexed, minutely granular at the swollen apex. Spikelets 1.3–1.7(1.9) mm long; glumes subequal, green-grayish, glabrous, ovate to oblong, occasionally lanceolate, apex frequently acute; lower glumes 0.7–1.6 mm long; upper glumes 1–1.7 mm long; lemmas 1.3–1.7(1.9) mm long, green-grayish, lanceolate, appressed-pubescent to open, silky hairs on midvein and margins, these hairs often appearing as ridges on the surface of the lemma at 20× magnification, apex often obtuse; paleas 1.2–1.7 mm long, almost as long as lemma, villous between veins; anthers 0.8–1.4 mm long, brown. Caryopsis 1–1.7 mm long, dorsally compressed, flattened, yellow.  $n = 8$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia shepherdii* occurs on wet seepage banks, washes, disturbed gravelly roadcuts, and slopes in pine–oak–madrone forests and pinyon–juniper woodlands with *Arctostaphylos*. It is endemic to Mexico and found in Chihuahua, Durango, Sonora, and Zacatecas at elevations of 1,900–2,900 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 15 mi W of Flores Magón, 16 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3500-B (ARIZ). Balleza: 0.5 mi NE El Vergel, 6 Sep 1985, 2100 m, *P.M. Peterson & Annable* 4069 (US); 16 mi SW of El Vergel on hwy 24, Río Verde, 6 Sep 1985, *P.M. Peterson & Annable* 4072, 4077 (ENCB, MEXU, US); 19.6 km W of Balleza and 74.2 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 2120 m, *P.M. Peterson, Annable & Valdés* 10751 (CIIDIR, US). **Batopilas:** SW Chihuahua, Aug–Nov 1885, *E. Palmer* 9 (US), lectotype. **Bocoyna:** 10.8 km N of Creel on Mex 127 and 20 km S of San Juanito, 10 Sep 1989, pine forest, 2235 m, *P.M. Peterson, Annable & Y. Herrera* 8005 (ENCB, MEXU, US); 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, *P.M. Peterson & Annable* 5872 (ENCB, MEXU, US). **Casas Grandes:** W of Casas Grandes, 3 mi NE of Cuesta Blanca, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3546 (ARIZ); 2 mi NE of Cuesta Blanca, W of Casas Grandes, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3539-Bi (ARIZ). **Chihuahua:** 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon–juniper woodlands, 2110 m, *P.M. Peterson & Annable* 12545 (US).

**Cuahtémoc:** 12 mi W of Cuahtémoc, 28 Oct 1959, Gould 8925 (US); 11 mi W of Cuahtémoc, 5 Oct 1966, *Reeder & C. Reeder* 4594 (ARIZ, ENCB, MEXU); Hotel Rancho la Estancia, 20 Oct 1981, laderas pedregosas con vegetación de encinar [rocky slopes with oak vegetation], **R. Guzmán** 4912 (MEXU). **Cusihiuriachic:** Cusihiuriachic, on la Bufa, 12 Sep 1986, *Spellenberg & J. Zimmerman* 8587 (US). **Guachochi:** 2.3 mi W of San Juanito on road towards Baquiriachic, 5 Oct 2000, bosque de pino [pine forest], 2590 m, *P.M. Peterson & J. Cayouette* 15362 (US). **Guadalupe y Calvo:** 15.2 mi E of Ocote on hwy 24 towards El Vergel, 14 Sep 2006, 2580 m, *P.M. Peterson* 20065, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Guerrero:** km 25 carr. [hwy] La Junta–Tomochi, Cd. Cuahtémoc, 6 Oct 1974, *Valdés-Reyna* VR-705 (ENCB); 35.4 mi W of La Junta on road to Parque Nacional Cascada de Basaseachic and 4.4 mi E of Tomochic, 30 Sep 1989, 2350 m, *P.M. Peterson & R.M. King* 8222 (ENCB, MEXU, NMC, US); 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable* 5857 (ENCB, MEXU, US); 37 km SW of La Junta on road to Creel at the puente [bridge] Arroyo Ancho, 10 Sep 1989, pine forest, 2230 m, *P.M. Peterson, Annable & Y. Herrera* 7992 (ENCB, MEXU, US); 10 km S de la Junta, carr. La Junta–Tomochi, 6 Oct 74, Bosque de pino–encino, 1900 m, *Valdés-Reyna* VR-700 (RELC). **Madera:** near Col. García in the Sierra Madre, 14 Sep 1899, *C.H.T. Townsend & C.M. Barber* 330 (US); 10 km al Sur de Madera, 5 Oct 74, Bosque de pino–encino, 2000 m, *Valdés-Reyna* VR-666 (RELC); Zona Arqueológica “40 casas” 20 km al NW de las varas, 28 Sep 1982, bosque de pino–encinar, 2140 m, *Tenorio & Romero* 1836 (MEXU). **Ocampo:** 20 mi W of Tomochic on road towards Cascada de Basaseachic, 22 Sep 1986, 2100 m, *P.M. Peterson & Annable* 4552 (ENCB, MEXU, US).

266. *Muhlenbergia sinuosa* Swallen, Contr. U.S. Natl. Herb. 29(4): 204. 1947.

FIGURE 177

Caespitose delicate annual. Culms 12–50 cm tall, erect, slender, very branched near base, sometimes geniculate-ascending, glabrous, scabrous below nodes. Sheaths glabrous or scabrous; ligule 1.5–3 mm long, hyaline, truncate to obtuse, toothed to lacerate; blades 2–8.5 cm long, 0.8–2 mm wide, flat to involute, short-pubescent to scabrous, midvein prominent. Panicle 10–26 cm long, 2.8–8 cm wide, branches 2.5–7 cm long, often capillary, 1 or 2 per node, ascending or something divergent, pedicels 4–7 mm long, slender, capillary, curved or reflexed. Spikelets 1.4–2 mm long, reflexed; glumes 0.7–1.2 mm long, equal, conspicuously pilose near apex and margins, hairs 0.3 mm long, 1-veined, apex acute to obtuse, awnless; lemma 1.4–2 mm long, oblong-elliptic, green, sometimes with purple spots, silky-pubescent, short-appressed along midvein and margins, apex acute to obtuse, awnless; palea 1.3–1.8 mm long, oblong-elliptic,



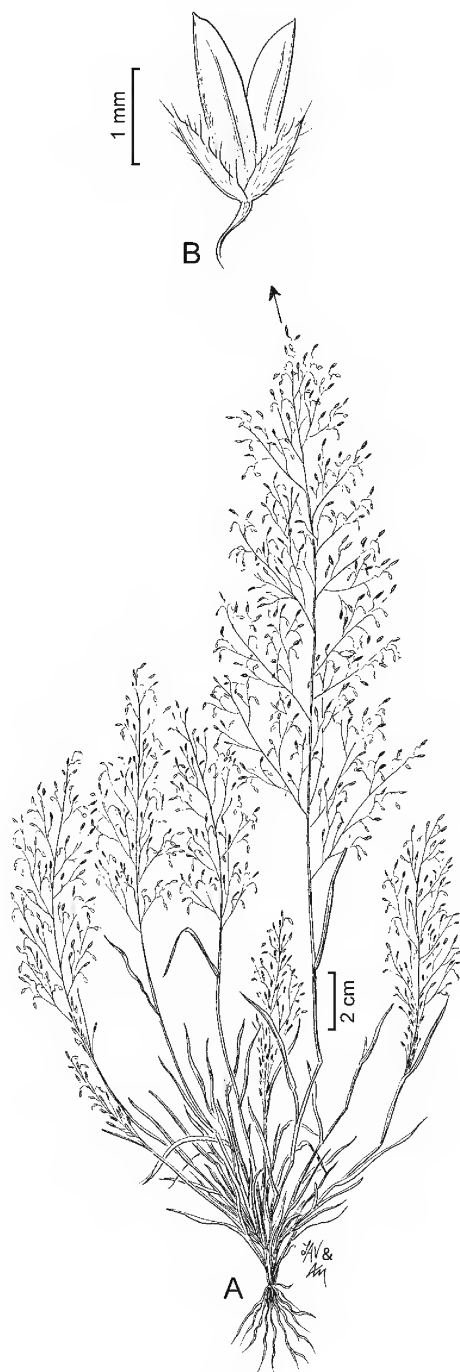


FIGURE 177. *Muhlenbergia sinuosa*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

glabrous; anthers 0.6–1.2 mm long, olive-green. Caryopsis 0.8–1.2 mm long, fusiform, brown.  $n = 10, 12$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia sinuosa* grows in pine forests at elevations of 1,650–2,300 m. It ranges from the United States to Mexico in Chihuahua and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cabecera de la cañada de Recogoata, 2100 m, B. Tab V. 28 (MEXU). **Casas Grandes:** 21 mi SW of Col. Juárez on road to Hernández Javales, 2200 m, P.M. Peterson & Annable 4031 (US); 25.0 mi SW of Col. Juárez on road to Hernández Javales, 2000 m, P.M. Peterson & Annable 4037 (US); About 43 mi SW of Casas Grandes, 2100 m, Reeder & C. Reeder 2694 (SLPM, US); 22.5 mi SW of Col. Juárez on rd to Hernández Javales, 2100 m, P.M. Peterson & Annable 4033 (US). 3 mi S of Hernández Javales, 32 mi SW of Col. Juárez, 2200 m, P.M. Peterson & Annable 4044 (US); 3 mi NE of Cuesta Blanca, W of Casas Grandes, Reeder & C. Reeder 3545 (US); 5 mi S of Hernández, W of Casas Grandes, Reeder & C. Reeder 3514 (US); 2 mi S of Hernández, W of Casas Grandes, Reeder & C. Reeder 3504 (US); 3 mi E of Cuesta Blanca, W of Casas Grandes, 2012 m, Reeder & C. Reeder 3220, 3236 (US); 21 mi W of Col. Juárez, 2100 m, Reeder & C. Reeder 3209 (US); 25 mi SW of Col. Juárez on road to Hernández Javales, 2000 m, Reeder & C. Reeder 4037 (US). **Chihuahua:** 32.5 km de la carr. [hwy] Panamericana rumbo [course] a Namiquimpa, 2340 m, M. Vergara 186 (MEXU); 32 km W of Hwy 45 towards Benito Juárez, 2110 m, P.M. Peterson & Annable 12546 (US). **Guerrero:** 4.5 mi W of Tomochic on Hwy 16, 2200 m, P.M. Peterson & Annable 4540 (US). **Madera:** About 15 mi S of Madera, 2165 m, Reeder & C. Reeder 2632 (CIIDIR, ENCB, US); 17 mi S of Madera, 2100 m, Reeder & C. Reeder 2629 (SLPM, US); 14.5 mi SE of Madera on Mex 16 to La Junta, 2200 m, P.M. Peterson & Annable 8179 (US); Chuichupa, LeSueur 155 (US); About 17 mi NW of Madera, 2285 m, Reeder & C. Reeder 2657 (US). **Namiquipa:** Sierra El Nido, 16.7 mi W of Hwy 45 on road up to Los Prietos Canyon, 2400 m, P.M. Peterson 12590 (US). **Riva Palacio:** 21.1 mi W of Hwy 45, 0.4 mi E of Cumbres de Majalca, 2200 m, P.M. Peterson & Annable 4523 (US); Parque Cumbres de Majalca, 2120 m, P.M. Peterson & Annable 5813 (US); 20 mi W of México 45 and about ½ mi E of Cumbres de Majalca, 7 Sep 1989, 2180 m, P.M. Peterson & Annable 7976 (US).

267. *Muhlenbergia speciosa* Vasey, Bull. Torrey Bot. Club 13(12): 231. 1886.

Densely caespitose perennial. Culms 1–1.5 m tall, strong, forming large mats, pilose below, hairs 1–1.5 mm long. Sheaths 35–60 cm long, compressed-keeled, pilose, auricles missing; ligules 0.5–1 mm long; blades 30–50 cm long, 2.5–4 mm wide, folded, pilose, pilose to somewhat glabrous. Panicles 40–60 long, 5–10 cm wide, straight or pendulous; branches 7–10(13) cm long, ascending or appressed, the upper divaricate, densely flowered, purplish to reddish; pedicels 0.5–2 mm long. Spikelets 1.2–2.2 mm long; glumes 1.4–2.3 mm long, longer than the lemma,

equal to subequal, apex obtuse, rarely awned, pilose, occasionally glabrous, hairs 0.5–0.7 mm long; lemma 1.2–2.2 mm long, pilose to sometimes glabrous, awned, the awn 8–12(17) mm long, flexuous, scabrous; paleas 1.2–2 mm long, pilose, obtuse; anthers 0.4–0.6 mm long, purplish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia speciosa* grows in oak and pine forests at elevations of 2,200–2,650 m. It occurs in Mexico in Chihuahua, Durango, Jalisco, Michoacán, Nayarit, and Sinaloa.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, *M.E. Siqueiros* 1628 (MEXU). **Moris:** South-western Chihuahua, 1900 m, *E. Palmer* 30 (MEXU, US) isotype.

**268. *Muhlenbergia strictior*** Scribn. ex Beal, Grass. N. Amer. 2: 263. 1896.

Caespitose annual; often decumbent. Culms 5–32 cm tall, strigulous below nodes, slender, branched. Sheaths with hyaline margins to green-yellowish, sparingly scabrous to apex; ligules 1.5–3.2 mm long, membranous, apex obtuse to truncate, erose or toothed, decurrent; blades 2–6.5 cm long, 1.2–2.5 mm wide, strigulose to minute-villous above, glabrous below. Panicles (3)5.2–11 cm long, 0.4–2(3.5) cm wide, contracted; branches 0.9–2.4 cm long, capillary, ascending, flowered to base, the florets overlapping, 1 or 2 per node. Spikelets 3–4.2 mm long, wide and dorsally flattened, straw color, short-pedicelled, appressed; glumes 1.2–2 mm long, subequal, glabrous to scaberulous near apex, 1-veined, narrow, acuminate, often mucronate, the mucros up 0.8 mm long; lower glumes ovate-lanceolate, apex acuminate; upper glumes oblong, apex abruptly acuminate, sometimes 2- to 3-lobed to 3-toothed; lemmas 3–4.2 mm long, oblong-ellipsoid, lanceolate, with prominent veins, yellowish when mature, with silky pubescence over the keels and margins, the hairs 0.3 mm long, apex entire or minute 2-toothed, the teeth 0.2 mm long, awned, the awns 1–3 mm long, delicate, straight; paleas 3–4.2 mm long, oblong-ellipsoid, glabrous, apex 2-toothed, the teeth 0.3 mm long; anthers 0.5–0.7 mm long, olive-green to light brown. Caryopsis 2–2.5 mm long, oblong, compressed, brown to yellowish.  $n = 10$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia strictior* grows in tropical and oak-pine forests at elevations of 1,500–2,650 m. It occurs in Mexico in Chihuahua, Distrito Federal, Durango, México, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 12.1 mi NE of El Vergel on Hwy 24, SW of Parral, 2000 m, *P.M. Peterson & Annable* 4066 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10709 (US). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, *B. Tab V. 38* (MEXU). **Casas Grandes:** 21 mi SW of Col. Juárez on road to Hernández Javales, 2200 m, *Correll & Gentry* 23226 (ENCB, US); *P.M. Peterson & Annable* 4039, 4043 (TAES, US); 5 mi S of Hernández, W of Casas Grandes, *Reeder & C. Reeder* 3512 (US). **Chihuahua:** Hills near

Chihuahua, 1800 m, *C.G. Pringle* 3034 (TAES, US). **Guachochi:** Cusarare, S of Creel, 2200 m, *Bye* 5191 (MEXU); 20.3 mi S of Creel on road towards Rocheachic, 2510 m, *P.M. Peterson & J. Cayouette* 15369 (US); 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, *P.M. Peterson, Annable & Valdés-Reyna* 10787 (US); 0.6 mi N of Guachochi, 2400 m, *P.M. Peterson & Annable* 5919 (US); 10.6 mi NE of La Bufa on road to Creel, 2235 m, *P.M. Peterson, Annable & Y. Herrera* 8071 (US); Flat rock outcrops at Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17673 (CIIDIR, US). **Guadalupe y Calvo:** 15.2 mi E of Ocote on hwy 24 towards El Vergel, 14 Sep 2006, 2580 m, *P.M. Peterson* 20063, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Guerrero:** 24 mi SW of La Junta on road to Creel, 2200 m, *Y. Herrera, P.M. Peterson & Annable* 954 (CIIDIR); 20 mi W of Tomóchic on road towards Cascada Basaseachic, 2200 m, *P.M. Peterson & Annable* 4553 (US); Miñaca, 13 Oct 1910, *Hitchcock* 7765 (US); Wet ledges by streams 2 ó 3 mi S of Guerrero, 2200 m, *C.G. Pringle* 1418 (MEXU, US); 4.5 mi W of Tomóchic on Hwy 16, 2200 m, *P.M. Peterson & Annable* 4539 (TAES, US); 13 mi SW of La Junta on rd to Creel, 2200 m, *P.M. Peterson & Annable* 5825 (US); 22 mi SW of La Junta on rd to Creel, 2200 m, *P.M. Peterson & Annable* 5831 (US); 24 mi SW of La Junta on road to Creel, 2200 m, *P.M. Peterson & Annable* 5852 (US); 15.5 mi W of La Junta on road to Tomóchic, 15 km mark on Hwy 16, 2100 m, *P.M. Peterson & Annable* 4054 (TAES, US); 25 mi W of La Junta on rd to Parque Nacional Cascada Basaseachic, 2200 m, *P.M. Peterson & R.M. King* 8194 (US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8219 (US); 20 mi SW of La Junta on road to Creel, *P.M. Peterson & Annable* 7894 (US); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomóchic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8239 (US). **Madera:** Round Valley, Sierra Madre, Sep 1903, 1950 m, *M.E. Jones* 7315 (MEXU, US), Isotype. **Ocampo:** Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *Tenorio & R. Torres* 3777, 4511 (MEXU, SLP); Parque Nacional de Cascada Basaseachic, 1 km airline S of Cascada, 2100 m, *R. Fierros* 1684 (MEXU); Along trail just above Cascada de Basaseachic, 1880 m, *P.M. Peterson & Annable* 12537 (US); Approx. 10 mi E of Basaseachic on Hwy towards La Junta, 2110 m, *P.M. Peterson & Annable* 12543 (US). **Riva Palacio:** 21 mi W of México 45, N of Chihuahua city, Col. Cumbres de Majalca, 2120 m, *P.M. Peterson & Annable* 4520 (TAES, US).

**269. *Muhlenbergia tarahumara*** P. M. Peterson & Columbus, J. Bot. Res. Inst. Texas 3(2): 528–531, f. 1–2. 2009.

FIGURE 178

Caespitose perennial. Culms 18–35 cm tall, erect, terete near the base, glabrous below the nodes, usually 3 nodes per culm; internodes glabrous and shiny. Sheaths 0.8–8 cm long, shorter than the internodes above, pubescent or glabrous; ligules 1–1.8 mm long, membranous, abaxially pubescent or glabrous,

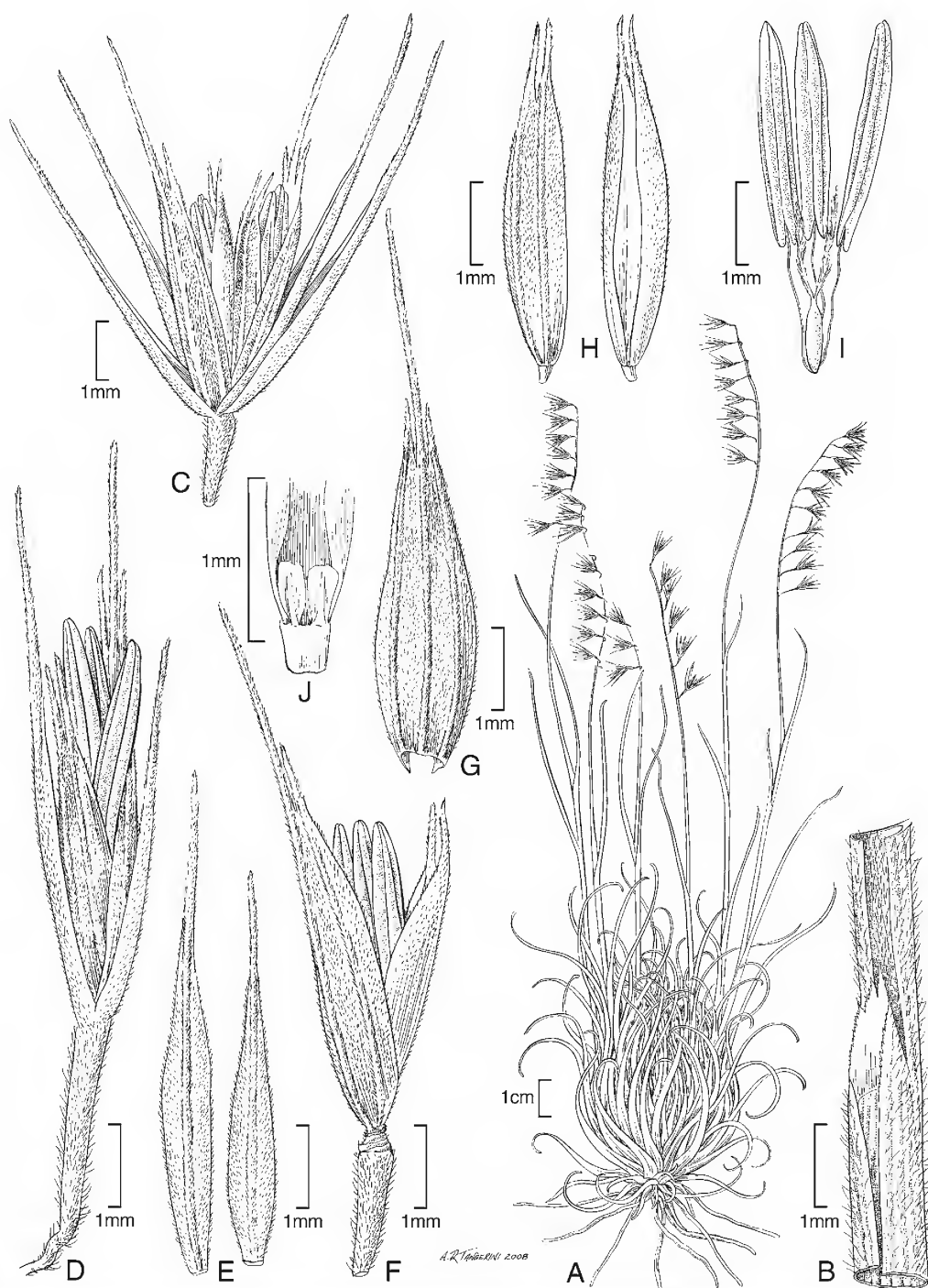


FIGURE 178. *Muhlenbergia tarahumara*. A. Habit. B. Ligule. C. Two paired spikelets. D. Branch with two spikelets (only one seen from this perspective). E. Glumes. F. Floret on branch axis (glumes, other spikelet removed). G. Lemma. H. Paleas. I. Stamens and pistil. J. Lodicules. Drawn by Alice R. Tangerini for Smithsonian Institution, Department of Botany.

apex acute, often erose, minutely ciliate; blades (2)3.5–13 cm long, 0.2–1.3 mm wide, flat to tightly involute, apically acuminate, somewhat sinuous, antrosely hirsute on both surfaces, the hairs 0.1–0.4 mm long. Panicles 3–6 cm long, 0.7–1.6 cm wide, narrow, with 5–13 racemosely arranged primary branches, 1 branch per node; branches 0.5–1.4 cm long, with 2 terminal spikelets, deciduous, disarticulation near the base, branches first ascending then spreading (bending sharply or curling near the base) from the culm axis, antrorsely hirsute, the hairs 0.2–0.4 mm long; inflorescence axis flattened, ending in terminal branch, margins hirsute; pedicels fused or 0.2–0.6 mm long, 1 slightly longer than the other, tightly appressed. Spikelets 4.5–7.8 mm long, appressed to one another, 1-flowered; glumes 3–5.8 mm long, narrowly lanceolate, usually equal in length, shorter than the lemma, membranous to chartaceous, 1-veined, pubescent, apex acuminate, awned, the awns 1.4–3.2 mm long; lemmas 3.6–7.3 mm long, lanceolate, awned, distinctly 3-veined, membranous to chartaceous, appressed-pubescent, apex acute to acuminate, bifid, the central awn 2–3.7 mm long, straight or slightly recurved, the lateral veins excurrent into awns 0.6–1.3 mm long; paleas 3–4.6 mm long, shorter than the lemma, membranous, glabrous below and appressed-pubescent near apex, 2-veined, apex acuminate, each vein excurrent as a mucro, the mucro 0.2–0.9 mm long; anthers 2.2–2.8 mm long, yellowish-orange.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia tarahumara* is known only from three locations in the Sierra Madre Occidental in Chihuahua, and a single location in Durango (Peterson & Herrera Arrieta 25508 [CIIDIR, US], Mpio. Santiago Papasquiaro near jtn of hwy 36 and turnoff to San Diego trout farm), and it occurs on rocky slopes, ridgetops, and white-tuff rock outcrops with *Pinus* spp., *Pinus lumholtzii* B. L. Rob. & Fernald, *Arctostaphylos pungens* Kunth, *Quercus*, *Cupressus*, *Ceanothus*, *Muhlenbergia lucida*, *M. montana*, and *M. rigida* at 1,880–2,407 m (Peterson and Columbus, 2009).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** 2 km W of Rio Coraréachi and E of Osichi, 1960–2040 m, 30 Aug 2003, P.M. Peterson & P. Catalán 17621 (CIIDIR, RSA, US); 41.3 km S of Creel on road to Batopilas, 2075 m, 10 Sep 1989, P.M. Peterson, Annable & Y. Herrera 8032 (ENCB, RSA, US); Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 1880–1900 m; 26 Aug 2003, P.M. Peterson & P. Catalán 17542 (CIIDIR, RSA, US); P.M. Peterson & J.M. Saarela 22053, 22079 (US).

270. *Muhlenbergia tenuifolia* (Kunth) Kunth, Révis. Gramin. 1(4): 63. 1829.

FIGURE 179

Loosely caespitose to densely tufted, annual to short-lived perennial with delicate base, flowering the first year. Culms 20–70 cm tall, erect or decumbent at the base, branching at the lower and middle nodes, wiry, scaberulous below the terete nodes; internodes generally 2.0–9.5 cm long. Sheaths 4.0–7.5 cm long, commonly shorter than the internodes, glabrous or scaberulous;

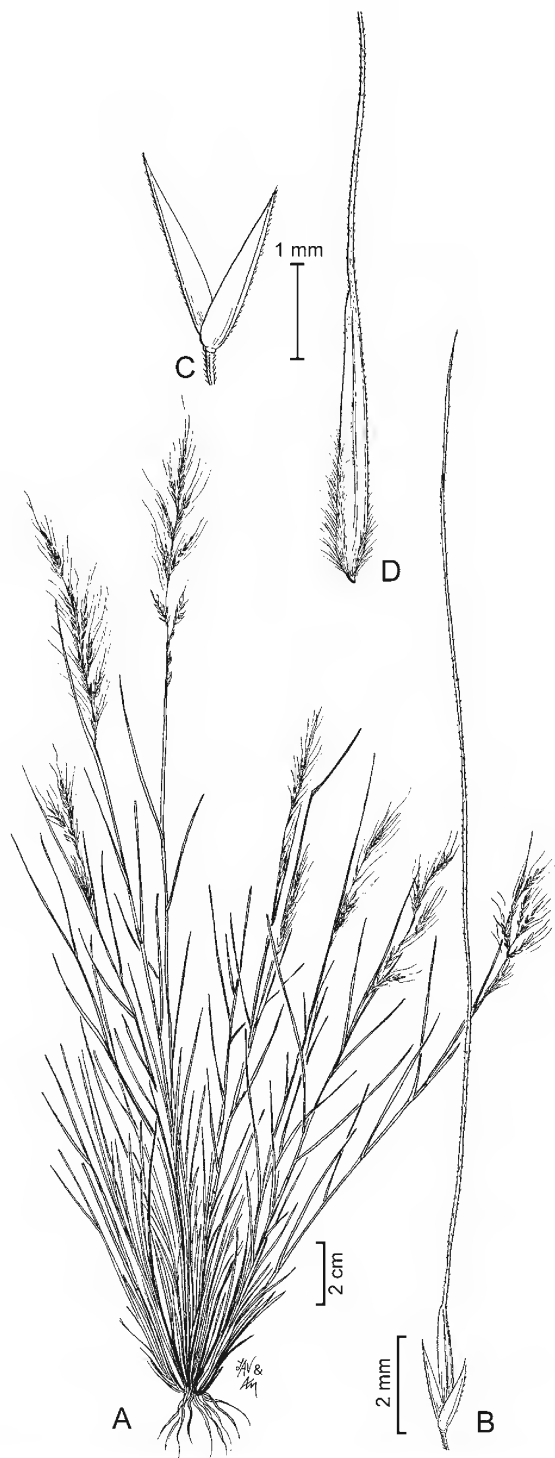


FIGURE 179. *Muhlenbergia tenuifolia*. A. Habit. B. Spikelet. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

ligules 1.2–3.0(5.0) mm long, membranous, apex acute, often lacerate with age; blades 2–13 cm long, 1.2–2.5 mm wide, flat or loosely involute, scaberulous to glabrous below and scabrous above. Panicles 7–20 cm long, 1.0–6.5 cm wide, narrow and contracted to loosely spreading, interrupted below, terminal and axillary, 15–23 nodes per panicle; primary branches 3.5–7.5 cm long, usually 1 per node, when immature the branches mostly appressed and ascending, when mature the branches sometimes widely spreading to 70° from the rachises; pedicels 1–3 mm long, usually shorter than the spikelets, antrorsely scabrous, stout, appressed or spreading. Spikelets 2–4 mm long, erect, often purplish; glumes 1.2–2.8 mm long, unequal, 1-veined, scabrous along the veins, apex acute to acuminate, often mucronate or erose, the mucro to 0.5 mm long; lower glumes 1.2–2.0 mm long; upper glumes 1.5–2.8 mm long, more than ½ as long as the lemma; lemmas 2.0–3.5(4.0) mm long, lanceolate, widest near the base, awned, scaberulous above and villous on proximal ½ along the margins and the midvein, the hairs 0.5–1.5 mm long, callus short-pubescent, the awn 10–30(40) mm long, scabrous, flexuous; paleas 1.8–3.4(3.8) mm long, lanceolate, sparsely appressed-pubescent between the veins on the proximal ½; anthers 0.9–1.5 mm long, yellowish. Caryopsis 1.0–2.2 mm long, narrowly fusiform, terete, brownish.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia tenuifolia* grows on rocky slopes, limestone rock outcrops, gravelly roadsides, and sandy drainages in grama grasslands and oak-pinyon-juniper woodlands at 1,200–2,500 m. It ranges from southern Arizona, New Mexico, and Texas south throughout Mexico in the mountains to Venezuela, Bolivia, Peru, and Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 15.6 mi NE of El Vergel on Hwy 24, 2000 m, *P.M. Peterson & Annable* 4062 (TAES, US); 11 mi SE of Balleza on road to Parral, 1800, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13524 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10712 (US); 7.4 km W of Balleza on road to Guachochi, 1660 m, *P.M. Peterson, Annable & Valdés-Reyna* 10735 (US); 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, *P.M. Peterson* 20017, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Batopilas:** 7.4 km SW of La Bufa and 15 km NE of Batopilas, 920 m, thorn scrub vegetation, 20 Sep 1991, *P.M. Peterson, Annable & Valdés-Reyna* 10848 (US); 33 mi S of Creel on road to Batopilas, 1810 m, *P.M. Peterson & R.M. King* 8038 (US). **Bocoyna:** 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2330 m, *Y. Herrera, P.M. Peterson & Annable* 962 (ENCB). **Buenaventura:** 15 mi W of Flores Magón, *Reeder & C. Reeder* 3498 (US). **Casas Grandes:** 20 km al SE de Nuevo Casas Grandes, 2100 m, *Hern.-Xol-10428* (US); About 43 mi SW of Casas Grandes, 2100 m, *Spellenberg, N. Zucker, Bye & R. Corral* 12256 (CIIDIR). **Cuauhtémoc:** Rancho La Estancia, 2300 m, *M.E. Siqueiros* 1722 (MEXU). **Chihuahua:** 39 km Carr. [hwy] Chihuahua–Namiquipa, 2300 m, *M. Vergara* 192 (MEXU); Río Bonito, 2000 m, *LeSueur* 091 (US); Rocky hills near Chihuahua,

1800 m, *C.G. Pringle* 428 (US); Chihuahua, 1800 m, *Hitchcock* 7779, 7787 (US); Hills near Chihuahua, 1800 m, *C.G. Pringle* 397, 929 (ENCB); 9.1 mi W of Hwy 45 on dirt road towards Santa Clara, 1690 m, *P.M. Peterson & Annable* 12586 (US). **Guachochi:** 38.4 mi W of Guachochi on Mexico 127 towards Creel, 2440 m, *M.E. Siqueiros* 1634 (MEXU); 8.8 km NE of La Bufa and 4.8 km S of Kirare, 1730 m, *P.M. Peterson, Annable & Valdés-Reyna* 10822 (US); Parque Nacional Barranca del Cobre, 1.6 km E of La Bufa, 1950 m, *P.M. Peterson & M.B. Knowles* 13581 (US); 15.4 mi S of Mex 127 and 5.5 mi N of La Bufa, 1845 m, *P.M. Peterson & R.M. King* 8056 (US); Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Río Urique crossing, 1891 m, *P.M. Peterson & P. Catalán* 17552 (US); West of Munérachi along route (trail) to Sorichique, 1701 m, *P.M. Peterson & P. Catalán* 17706 (US). **Hidalgo del Parral:** 13.5 mi W of Parral on Hwy 24 towards El Vergel, 2000 m, *P.M. Peterson & Annable* 4555 (ENCB, US); 26 mi NE of Parral, 2100 m, *F.W. Gould & J. Morrow* 7945 (TAES); NE edge of Parral, *Correll* 22682, 22686 (US); 3 mi NE of Parral on Hwy 45 towards Chihuahua, 2000 m, *P.M. Peterson & Annable* 4059 (TAES, US); 3 mi E of Parral, *Reeder & C. Reeder* 3454 (US); 1.5 mi NE of Parral on Hwy 45 towards Chihuahua, 2000 m, *P.M. Peterson & Annable* 4060 (TAES, US); 12 km al NE de Hidalgo del Parral, 2 km al N de La Estancia, 1740 m, *E. Aldrete s.n.* (INEGI); 13 km al NE de Hidalgo del Parral, 1740 m, *E. Aldrete s.n.* (INEGI); 36 mi N of Parral on MEX 24 towards Chihuahua, 2000 m, *P.M. Peterson & R.M. King* 8102 (US). **Ignacio Zaragoza:** 12.6 mi NE of Ignacio Zaragoza, 2400 m, *P.M. Peterson & R.M. King* 8163, 8164 (US). **Jiménez:** Sta Eulalia Mts, *C.G. Pringle* 396 (US); *E. Wilkinson* 40, 48 (US); 2 km N of San Antonio, Sierra de Sta Eulalia, *L. H. Harvey* 1513 (US); 24 mi NW of Chihuahua–Durango State line, 1580 m, *Reeder & C. Reeder* 4838 (ENCB, US); Vicinity of Sta Eulalia, 1300 m, *E. Palmer* 133 (US). **Matamoros:** 12 mi S of Villa Matamoros on Hwy 45 towards Parral, 1900 m, *P.M. Peterson & Annable* 4085 (TAES, US); *P.M. Peterson & R.M. King* 8253 (US); 19.3 km S of Villa Matamoros on Hwy 45 to Durango, 1800 m, *P.M. Peterson & Annable* 5975 (US). **Riva Palacio:** 0.7 mi W of Nuevo Majalca, 8.5 mi W of Hwy 45, 1700 m, *P.M. Peterson & Annable* 4513 (US); 38 km W of Hwy 45 on road towards Benito Juárez, 2230 m, *P.M. Peterson* 12554 (US). **San Francisco del Oro:** Ejido Corral de Duarte, 1950 m, *E.S. Blanco* 1553 (MEXU); 23 km al NW de San Francisco, 2100 m, *Dávila, Tenorio & J. Sánchez-Ken* 130 (MEXU). **Valle de Zaragoza:** 54.4 mi N of Parral on Mex 24 to Chihuahua, 2100 m, *P.M. Peterson, Annable & Y. Herrera* 8103, 8104 (US).

271. *Muhlenbergia texana* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 91. 1862.

FIGURE 180

Caespitose, delicate annual. Culms 10–40 cm tall, erect, strigulose below the nodes; internodes 9–35 mm long. Sheaths 2.5–4 cm long, shorter or longer than internodes, strigulose; ligules 1–2.5 mm long, hyaline, apex lacerate, acute to obtuse;



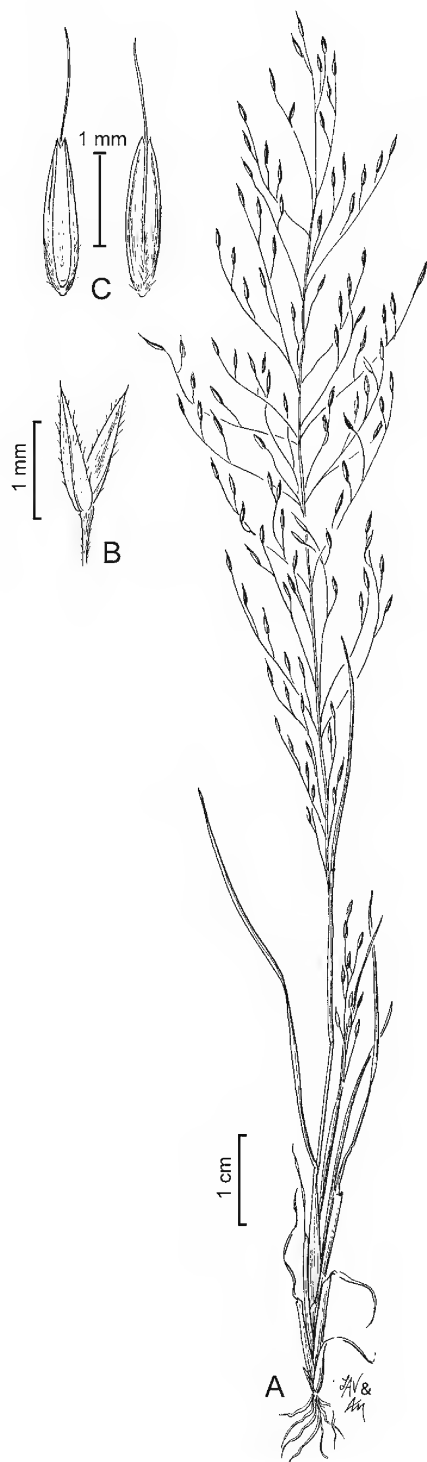


FIGURE 180. *Muhlenbergia texana*. A. Habit. B. Glumes. C. Two florets. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

blades 2–8 cm long, 0.8–2 mm wide, flat or involute, scabrous to sparsely strigulose. Panicles 9–20 cm long, 2–6 cm wide; branches 1–6 cm long, ascending or open, occasionally capillary, spreading up to 70° from the culm axis; pedicels 2–7 mm long, longer than florets, usually spreading. Spikelets 1.4–2.2 mm long, ascending, straight; glumes 0.8–1.5 mm long, subequal, sparsely hirsute to pilose near apex and along margins, 1-veined, apex acute or acuminate; lower glumes 0.8–1.2 mm long; upper glumes 0.9–1.5 mm long, slightly wider near base than lower glume; lemmas 1.4–2.2 mm long, lanceolate, awned, short-pubescent along the raised midvein and margins on proximal ½, apex acute or acuminate, mucronate or with awn up to 2 mm long; paleas 1.4–2.2 mm long, oblong-elliptic, minutely appressed-pubescent at the base, apex acute; anthers 0.4–0.5 mm long, purplish. Caryopsis 0.8–1 mm long, fusiform, brown.  $n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia texana* grows in oak–pine–cedar forests at elevations of 1,420–2,650 m. It ranges from United States to Mexico in Baja California, Baja California Sur, Chihuahua, Durango, Nayarit, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 64.5 km W of Balleza and 30.6 km E of Guachochi, 2650 m, P.M. Peterson & Annable 5937, 10777 (US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10720 (US). **Batopilas:** 22 km al S de Humira, 21.8 km al SW de la dev. a La Bufa, 2070 m, Tenorio & R. Torres 3690, 3691 (MEXU). **Bocoyna:** Cabecera de la cañada de Recogoata, 2400 m, B. Tab V. 44-A (MEXU). **Casas Grandes:** 3 mi S of Hernández Javales, 32 mi SW of Col. Juárez, 2200 m, P.M. Peterson & Annable 4045 (US); 21 mi SW of Col. Juárez on road to Hernández Javales, 2200 m, P.M. Peterson & Annable 4028 (US); 3 mi W of Cuesta Blanca, W of Casas Grandes, Reeder & C. Reeder 3216, 3217 (US). **Chinipas:** Sierra Milpillás 28.1 mi E of Los Tanques on road to Chinipas, 1.6 mi N of Los Chinicas, 2100 m, P.M. Peterson & Annable 4175 (TAES, US); 3.4 mi W of Saguarivo on road to Chinacas, 10 Sep 2008, rocky slopes with *Acacia*, *Opuntia*, *Quercus*, 1617 m, P.M. Peterson & J.M. Saarela 22169 (US); Sierra Milpillás, 24.1 mi E of Los Tanques on road to Milpillás, 2100 m, A.A. Beetle, R. Alcaráz & R. Cuadra M-9085, 9203, 9206, M-9251 (MEXU); Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, P.M. Peterson & J.M. Saarela 22136 (US). **Guachochi:** Parque Nacional Barranca del Cobre, 24.8 km NE of La Bufa on road to Samachic, 2440 m, P.M. Peterson, Annable & Valdés-Reyna 10802 (US); 28.3 km S of Cusarare on road to Guachochi, entering Barranca del Cobre, 1900 m, P.M. Peterson & Annable 5907 (US); 25.6 mi S of Creel on road to Batopilas, 2100 m, P.M. Peterson & Annable 8037 (US); 24.3 mi S of Creel on road to Batopilas at Barranca del Cobre, 1930 m, P.M. Peterson, Annable & Y. Herrera 8015 (US); Flat rock outcrops at Napuchis, 2140 m, P.M. Peterson & P. Catalán 17674 (CHIDIR, US); 10.6 mi NE of La Bufa on road to Creel, 2235 m, P.M. Peterson, Annable & Y. Herrera 8070 (US); Parque Nacional Barranca del Cobre, 13.6 mi NE of La Bufa on road towards Samachique, 2240 m,

*P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13569 (US); 5.5 mi S of Cieneguita de Barranca on road towards Sorichique, 2125 m, *P.M. Peterson, P. Catalán, C. López, & G. Villegar* 17704 (US). **Guerrero:** 16 km SW of La Junta on road to Creel, 2270 m, *P.M. Peterson & Annable* 9613 (US); 4.5 mi W of Tomóchic on Hwy 16, 2200 m, *P.M. Peterson & Annable* 4542 (TAES, US); 35.4 km SW of La Junta and 74 km N of Creel, 2200 m, *P.M. Peterson & Annable* 5827, 5829 (US); 54.3 km W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8215 (US). **Madera:** 12 mi SW of Madera of Hwy 16 towards Cuauhtémoc, 2100 m, *P.M. Peterson & Annable* 4049 (TAES, US); 15 mi S of Madera, 2165 m, *Reeder & C. Reeder* 2636 (US). **Matamoros:** 18.2 km SE of Villa Matamoros on Mex 45 to Durango, 1780 m, *P.M. Peterson, Annable & Valdés-Reyna* 10862 (US). **Moris:** 9.6 mi E of Maycoba on Hwy 16 towards Yepachic, 1420 m, *P.M. Peterson & Annable* 12508 (US); Approx. 17.6 mi E of Maycoba on Hwy 16 towards Yepachic and 2 mi E of Sonora/Chihuahua boundary, 1540 m, *P.M. Peterson & Annable* 12512 (US). **Ocampo:** Cascada de Basaseachic, 37 mi W Tomóchic, 2200 m, *P.M. Peterson & Annable* 4545 (US); Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable* 12524, 12525, 12538 (US). 76 mi W of La Junta and 35.2 mi W of Tomochoic in Parque Nacional Cascada de Basaseachic, 2100 m, *P.M. Peterson & R.M. King* 8227, 8245 (US). **Uruáchi:** 1.8 mi W of Yécora on Hwy 16 towards Maycoba, 1860 m, *P.M. Peterson & J. Cayouette* 15316 (US); 9 mi E of Yécora on Hwy 16 towards Maycoba and 10.7 mi S on a dirt road toward Talayote, 1800 m, *P.M. Peterson & Annable* 12483 (US).

**272. *Muhlenbergia torreyi* (Kunth) Hitchc. ex Bush, Amer. Midl. Naturalist 6: 84. 1919.**

FIGURE 181

Caespitose perennial. Culms 10–40(50) cm tall, decumbent at base, hirsute below the nodes, usually no culm nodes exposed above the tightly clustered leafy base, the leafy portion not reaching more than  $\frac{1}{2}$  the plant height; internodes mostly scabrous to glabrous. Sheaths 0.1–2.5(3.2) cm long, shorter than the internodes, scaberulous to glabrous, margins hyaline; ligules 2–5(7) mm long, hyaline, often splitting down the middle and appearing as auricles, apex acuminate, lacerate, margins entire; blades 1–3(5) cm long, 0.3–0.9 mm wide, tightly involute or folded, arcuate, somewhat sharp pointed, scaberulous. Panicles 7–21 cm long, 3–15 cm wide, open, diffuse; primary branches 1–8 cm long, ascending to stiffly spreading at maturity 30°–90° from the rachises; pedicels 1–8 mm long, erect, sometimes appressed to the branches. Spikelets 2–3.5 mm long, erect; glumes 1.3–2.5 mm long, about equal in length, 1-veined, awnless, mucronate or awned, scaberulous toward apex, apex acute to acuminate, minutely erose, the mucro or awn to 1.1 mm long; lemmas 2–3.2(3.5) mm long, narrow elliptic to lanceolate, mucronate or awned, appressed-pubescent on the margins and midvein on the proximal  $\frac{1}{2}$  to  $\frac{3}{4}$ , scabrous above, apex acuminate,

the mucro or awn 0.5–4 mm long; paleas 2–3.2(3.5) mm long, narrow elliptic, sparsely pubescent between the veins, apex acuminate, sometimes with 2 mucros, the mucros 0.2 mm long; anthers 1.2–2.1 mm long, greenish. Caryopsis 1.7–2.0 mm long, fusiform, brownish.  $2n = 20, 21$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia torreyi* grows in desert grasslands, sandy mesas, calcareous rock outcrops, rocky slopes, and open woodlands at 1,000–2,450 m; it ranges from the south central United States to northern Mexico in Chihuahua and Sonora and is disjunct in northwestern Argentina and Bolivia.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Janos:** Chihuahua–Sonora border, Rancho Carretas, 1780 m, *A.A. Beetle M-7975* (MEXU).

**273. *Muhlenbergia tricholepis* (Torr.) Columbus, Aliso 28: 66. 2010. *Blepharoneuron tricholepis* (Torr.) Nash, Bull. Torrey Bot. Club 25(2): 88. 1898. *Muhlenbergia tricholepis* (Torr.) P. M. Peterson, Amer. J. Bot. 97(9): 1546. 2010.**

Densely tufted, caespitose perennial. Culms 10–70 cm tall, 0.3–0.7 mm diameter just below the inflorescence, glabrous to scabrous just above and below nodes, slender, erect; internodes 1.2–10 cm long. Sheaths 1.8–9.5 cm long, shorter or longer than internodes, usually glabrous, crowded near the base, the margins glabrous, occasionally scabrous, whitish; ligules (0.3)0.7–2(2.7) mm long, hyaline to opaque, truncate to obtuse, margins entire, decurrent, apex erose-toothed to finely ciliate and irregularly toothed; blades 1–15 cm long, 0.6–2.5 mm wide, filiform, involute, arcuate, scabrous in both surfaces, the midvein evident, raised abaxially. Panicles 3–25 cm long, 1–10 cm wide, narrow or open; primary branches 1–6 cm long, ascending, spreading up to 50° from the rachises, 1–3 per node; pedicels 2–9 mm long, slender, capillary, minutely granular just below the spikelet, flexuous nodding to reflexed; 5–25 nodes per panicle. Spikelets 2.3–3.4(3.8) mm long, grayish-green; glumes (1.5)1.8–3.2(3.7) mm long, nearly equal to subequal in length, grayish-green (olivaceous) and occasionally purplish tinged, glabrous, ovate to oblong-elliptical, the apex obtuse to acute often irregularly toothed; lower glumes (1.5)1.8–2.6(3) mm long; upper glumes (1.7)2–3.2(3.7) mm long, broader and often appearing 3-veined by its characteristic folding, however, only the midvein contains a vascular trace; lemmas (2)2.3–3.4(3.8) mm long, lanceolate, grayish-green (olivaceous), often purplish tinged, apex acute to obtuse with a thick covering of appressed to spreading tawny to shining silky hairs on the midvein and margins, the hairs to 1.2 mm long; paleas (2)2.2–3.5(3.9) mm long, densely villous between the veins; anthers 1.2–2.1 mm long, brownish. Caryopsis 1.2–1.4 mm long, fusiform to elliptic, the embryo with a dorsal ridge extending  $\frac{2}{3}$  of the grain, light brownish.  $2n = 16$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia tricholepis* occurs in dry rocky to sandy slopes, canyon walls, rock outcrops, dry meadows, and open woods in pine–oak–madrone forests with *Arctostaphylos* spp., pinyon–juniper woodlands, spruce–fir forests, and pine woodlands at 700–3,660 m. It occurs

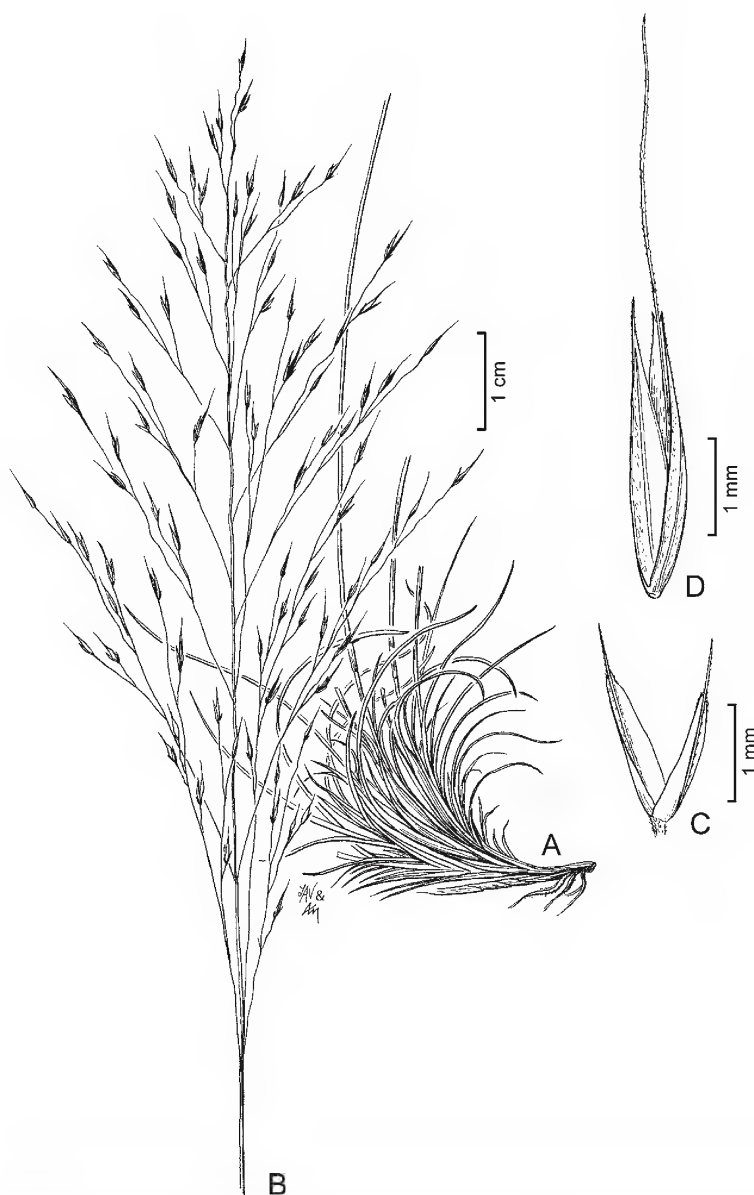


FIGURE 181. *Muhlenbergia torreyi*. A. Habit. B. Inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

in central Mexico north throughout the Sierra Madre Occidental and Sierra Madre Oriental.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 19.3 km E of Guachochi, 26 Sep 1988, pine forest, 2300 m, *P.M. Peterson & Annable* 5924 (ENCB, MEXU, US); 29 km E of Guachochi on Mex 127 towards Balleza, 13 Sep 1989, 2600 m, *P.M. Peterson, Annable & Y. Herrera* 8086

(ENCB, MEXU, US). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 6 (MEXU, US); Between Quirire and basigochic, 4 Jun 1974, pine-oak, 7000 ft, *Bye* 6126 (MEXU). **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7670 (MEXU, US); cabecera de la cañada de Bocogoata, 22 Sep 1997, pine forest-encino en cañada [oak glen], 2400 m, *B. Tab V. 40* (MEXU); SW of Creel around small mesas S of old Sánchez road, 30 Oct 1972, *Bye*

3049 (MEXU); NW of Cusarare near boundary with san Ignacio Arareco, 15 Oct 1973, pine-oak, 7200 ft, *Bye 5451* (MEXU). **Casas Grandes:** W of Casas Grandes, 3 mi E of Cuesta Blanca, 4 Sep 1958, 2073 m, *Reeder & C. Reeder 3221* (ARIZ, ENCB, US); W of Casas Grandes, 5 mi S of Hernández, 18 Sep 1960, 7000 ft, *Reeder, C. Reeder & Soderstrom 3520* (ARIZ, ENCB, MEXU). **Chihuahua:** Summits Mapula Mts, 26 Oct 1886, C.G. Pringle 822 (ENCB, MEXU, US); 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2110 m, *P.M. Peterson & Annable 12551* (US); 38 km W of hwy 45 on road towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2230 m, *P.M. Peterson & Annable 12577* (US); 17.5 mi W of hwy 45 on road up Los Prietos Canyon, 18 Oct 1992, pinyon woodlands, 2120 m, *P.M. Peterson & Annable 12598* (US). **Cuauhtémoc:** 11 mi W of Cuauhtémoc, 5 Oct 1966, *Reeder & C. Reeder 4594-Bis* (ARIZ). **Guachochi:** 8.5 km S of Cusarare on road to Guachochi, 25 Sep 1988, pine forest, 2400 m, *P.M. Peterson & Annable 5881* (ENCB, MEXU, US); 24.6 km W of Guachochi and 0.6 km S of Roachachi, 2340 m, *P.M. Peterson, Annable & Valdés-Reyna 10782* (US); Cusarare along arroyo just NW of cusarare church, 14 Oct 1977, 2200 m, *Bye & W.A. Weber 8122* (MEXU); East of Yahuirachi east of Cusarare, 16 Oct 1973, pine-oak, 2100 m, *Bye 5457* (MEXU). **Guerrero:** 10 km S La Junta; carr. [hwy] La Junta-Temochi, 5 Oct 74, pine forest-encino, 1900 m, *Valdés-Reyna VR-710* (RELC); km 193 carr. Chihuahua-Hermosillo tramo [section] San Pedro Temochic, 24 Sep 1997, 2200 m, *M.A. Vergara 172* (MEXU); 24 Sep 1997, pine forest, 2200 m, *M.A. Vergara 167* (MEXU); 46.7 km W of La Junta on road to Parque Nacional Cascada de Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King 8198* (US). **Madera:** near Col. Garcia in the Sierra Madre, 15 Sep 1899, 2300 m, *C.H.T. Townsend & C.M. Barber 333* (US). About 7 mi NW of Madera on a rocky slope with scattered pines, oaks, and junipers, 10 Oct 1953, 2195 m, *Reeder & C. Reeder 2661* (ENCB, MEXU). **Ocampo:** Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 5 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8869* (NMC). **Riva Palacio:** Parque Nacional, 0.4 mi E of Cumbres de Majalca, 21.1 mi W of hwy, 20 Sep 1986, bosque de pino [pine forest], 2200 m, *P.M. Peterson & Annable 4521* (ENCB, US). **Tomachic:** al lado [side] de la carr. a Creel, Tomachic, 17 Sep 1975, *J. Passini & M.F. Robert 6908* (ENCB). **Zaragoza:** 5.3 km al sur [S] de Lalolandia, 27 Oct 77, pine forest-encino, 2200 m, *S. González & J.M. Peña 792* (RELC).

274. *Muhlenbergia unisetata* (Lag.) Columbus, *Aliso* 28: 66. 2010. *Hymenothecium unisetum* Lag., *Gen. Sp. Pl.* 4. 1816. *Aegopogon tenellus* (DC.) Trin.

FIGURE 149A,B

Slender often sprawling, caespitose annual. Culms (2) 6–30 cm tall, glabrous below the nodes; internodes 0.6–6 cm long, glabrous to pilose. Sheaths mostly 0.5–4.8 cm long, shorter than the internodes, glabrous to sparsely pilose; ligules 0.6–1.5 mm long, apex mostly truncate, lacerate; blades 1.5–6 cm long,

0.5–1.5(1.7) mm wide, flat, scaberrulent and pubescent above, smooth beneath. Panicles 2–6 cm long, 0.5–1.2 cm wide, open, loosely flowered; racemose primary branches 3–5 mm long, excluding the awns, 1 per node. Spikelets 1.5–3.2 mm long, often greenish or purplish, the clusters with 1 short-pedicelled spikelet (perfect), the pedicels 0.2–0.6 mm long, and the other 2 spikelets (staminate or sterile) short-pedicelled, the pedicels about 0.7–1.5 mm long; glumes (1) 1.3–2 mm long, oblong and wider distally, apex deeply notched, entire or mucronate, the mucro 0.2–1 mm long, lobes obtuse or rounded; lemmas 2.5–3.2 mm long, 3-awned, the central awns 3–8(11) mm long, lateral awns usually mucronate or awned up to 2 mm long or missing; paleas 2.2–3 mm long, puberulent, apex 2-mucronate, the mucros less than 0.8 mm long; anthers 0.5–0.8 mm long, yellowish. Caryopsis 1.1–1.3 mm long, obovoid, light brownish.  $2n = 20, 60$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia unisetata* grows on moist slopes, cliffs, canyons, roadsides and along or near springs, usually in shaded areas associated with *Pinus* and *Quercus*, at 1,300–2,860 m. It ranges from southern Arizona to most of Mexico and Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 18 Sep 1991, pine forest-encino [oak], 2210 m, *P.M. Peterson, Annable & Valdés-Reyna 10700* (CIIDIR). **Casas Grandes:** W of Casas Grandes, 2 mi NE of Cuesta Blanca, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom 3540* (ARIZ). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela 22110* (US); Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, *P.M. Peterson & J.M. Saarela 22149* (US). **Chihuahua:** Chihuahua, 27 Apr 1908, *E. Palmer 28* (US). **Gómez Farías:** Laguna de Babicora, Cerro Canoas, 3 Sep 1994, 2400 m, *T. Lebgue, G. Quintana & E. Estrada 2921* (NMC). **Guachochi:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 5 Sep 2008, 1890 m, *P.M. Peterson & J.M. Saarela 22044* (US); 5.5 mi S of Cieneguita de Barranca on road towards Sorichique, 5 Sep 2003, pine forest-encino, 2125 m, *P.M. Peterson & P. Catalán 17701* (US); Steep slopes above Barranca Basihuare, 28 Aug 2003, pine forest-encino, 1815 m, *P.M. Peterson & P. Catalán 17575* (US). **Guerrero:** Tomochi, 2 km alrededor del poblado [around the village], 24 Sep 1987, pine forest, 2100 m, *M.A. Vergara 150* (CIIDIR, ENCB); Arroyo ancho, 15 Oct 1887, C.G. Pringle 1408 (US); **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, pine woods, 2400 m, *P.M. Peterson & R.M. King 8152* (ENCB). **Madera:** La Tinaja, ejido El Long, 29 Aug 1990, bosque de encino-pino [oak-pine forest], 1840 m, *O. Bravo 1334* (CIIDIR, ENCB); 3 km al Noreste de Madera, 5 Oct 74, bosque de pino-encino, 2000 m. *Valdés-Reyna VR-689, VR-646* (RELC). **Ocampo:** Parque Nacional "Cascada de Basaseachic," in camp ground area, 22 Sep 1994, 2000 m, *Spellenberg, Corral, Estrada & Mahr 12072* (NMC); Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8649* (NMC); Near Mirador of Cascada Basaseachic,

2022 m, slopes with *Pinus*, 7 Sep 2008, *P.M. Peterson & J.M. Saarela* 22098 (US). **San Francisco del Oro**: San Francisco del Oro mines, 20 mi from Parral, *Soderstrom* 876 (US).

275. *Muhlenbergia utilis* (Torr.) Hitchc., J. Wash. Acad. Sci. 23(10): 453. 1933.

FIGURE 175E-I

Perennial; with slender, scaly rhizomes. Culms 7–30 cm tall, erect to decumbent, older plants trailing, up to 1 m long, minutely pubescent to glabrous below the nodes; internodes mostly smooth to lightly nodulose roughened. Sheaths 0.3–2.4 cm long, shorter or longer than the internodes, glabrous, margins hyaline; ligules 0.2–0.8 mm long, membranous, decurrent, apex truncate; blades 0.5–4.7 cm long, 0.2–1.8 mm wide, involute, sometimes flat, straight or arcuate-spreading, blades often at right angles to culms, mostly glabrous abaxially and hirsutulous adaxially. Panicles 1–5 cm long, 0.1–0.4 cm wide, narrow, contracted, interrupted between each branch, partially included in the upper sheaths; primary branches 0.2–1.2 cm long, appressed, rarely ascending to 30° from the rachises; rachises usually visible between the branches; pedicels 0.1–1.1 mm long, glabrous. Spikelets 1.4–2.4 mm long, erect; glumes 0.5–1.4 mm long,  $\frac{1}{3}$  to  $\frac{1}{2}$  as long as the lemma, subequal, unawned, glabrous, usually 1-veined, occasionally 2- to 3-veined, yellowish to light green, apex acute; lemmas 1.3–2.4 mm long, lanceolate, unawned, glabrous or with minute appressed pubescence along the margins and the base, the hairs about 0.1 mm long, green or purplish, apex acute; paleas 1–2 mm long, lanceolate, glabrous, apex acute; anthers 0.7–1.4 mm long, yellow to purplish. Caryopsis 0.7–1.2 mm long, ellipsoid to ovoid, brown.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia utilis* occurs in wet soils along streams, ponds, depressions in grasslands, and alkaline or gypsiferous plains associated with *Quercus* spp. at 200–2,500 m. It ranges from the southern United States to Mexico in Chiapas, Chihuahua, Durango, Guanajuato, Hidalgo, Jalisco, México, Distrito Federal, Michoacán, Puebla, Querétaro, Sonora, Veracruz, and Zacatecas, and to Costa Rica.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Casas Grandes**: 5 km al NE de Cuesta Blanca, 1980 m, *M.A. Martínez s.n.* (ENCB). **Cuauhtémoc**: 12 mi W of Cuauhtémoc, 2128 m, *Reeder & C. Reeder* 2622 (ENCB, US). **Chihuahua**: Hills near Chihuahua, 1800 m, *C.G. Pringle* 418 (US); La Campana, 10 km W carr. [hwy] Panamericana, 1700 m, *F.W. Gould* 8911 (TAES). **Madera**: Mesa de El Poleo, ejido El Long, 2400 m, *Blanco* 08/77 (IBUG).

276. *Muhlenbergia vaginata* Swallen, Contr. U.S. Natl. Herb. 29(9): 406. 1950.

Annual or short-lived perennial. Culms 16–40 cm tall, lax, slender, glabrous, decumbent, rooting at the lower nodes. Sheaths 0.7–1.6 cm long, shorter than the internodes, glabrous; ligules 1.3–3 mm long, hyaline, apex acute to obtuse, decurrent; blades 0.5–3.5(4) cm long, 0.6–1.8(2) mm wide, mostly cauline, flat or folded, with navicular apex, glabrous to scabrous. Panicles

0.5–3 cm long, 3–7 mm wide, frequently partially included in the upper sheath; branches 3–10 mm long, ascending or appressed; pedicels 0.5–3 mm long, appressed, scabrous. Spikelets 1.6–2.5 mm long; glumes 0.6–1 mm long, subequal, glabrous, 1-veined, oblong to ovate, light green to green-grayish, apex obtuse, rounded to subacute, occasionally erose; lower glumes 0.6–0.8 mm long; upper glumes 0.6–1 mm long; lemmas 1.6–2.5 mm long, lanceolate, sparsely pubescent below and along the mid-vein and margins, mottled with olive-green spots, often purplish, apex scabrous, acuminate, sometimes mucronate, the mucro 0.2 mm long; palea 1.5–2.5 mm long, lanceolate, glabrous or with a few hairs between the veins; anthers 0.5–0.8 mm long, purplish. Caryopsis 1–1.2 mm long, ellipsoid to fusiform, brown.  $n = 9$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia vaginata* occurs in pine-oak forests at elevations of 1,880–2,400 m and ranges from Mexico to Central America. In Mexico it is found in Chiapas, Chihuahua, Distrito Federal, Durango, Hidalgo, Jalisco, México, Michoacán, Morelos, Puebla, Querétaro, Sinaloa, Tlaxcala, and Veracruz.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza**: 0.5 mi NE El Vergel, 6 Sep 1985, 2100 m, *P.M. Peterson & Annable* 4070 (US). **Batopilas**: Hacienda San Miguel, near Batopilas, 2100 m, *E. Palmer* 17 (TAES, US); 308 (TAES). **Bocoyna**: 18.7 mi S of San Juanito on road to Creel, 2200 m, *P.M. Peterson & Annable* 5862 (US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, *P.M. Peterson & R.M. King* 8220 (US). **Carichi**: Sánchez, 12 Oct 1910, 2400 m, *Hitchcock* 7723 (US). **Guachochi**: 20.3 km NE of La Bufa and 3.2 km S of Basigochi, 2180 m, *P.M. Peterson & Annable* 10816 (US); Flat rock outcrops at Napuchis, 2140 m, *P.M. Peterson & P. Catalán* 17668 (CIIDIR, US); 0.6 mi N of Guachochi, 2400 m, *P.M. Peterson & Annable* 5917 (US); 20.3 mi S of Creel on road towards Rocheachic, 2510 m, *P.M. Peterson & J. Cayouette* 15370 (US). **Guadalupe y Calvo**: near Cumbre Mohinora, 13 Sep 2006, 3300 m, *P.M. Peterson* 20037, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (CIIDIR, US). **Guerero**: 16 km SW of La Junta on road to Creel, 2270 m, *P.M. Peterson & Annable* 5866 (US); 23.6 mi W of Hwy jct at La Junta on road to Tomóchic, 18 mi E of Tomóchic, 2200 m, *P.M. Peterson & Annable* 4538 (ENCB, US); 15.5 mi W of La Junta on road to Tomóchic, 15 km mark on Hwy 16, 4 Sep 1985, 2100 m, *P.M. Peterson & Annable* 4052 (ENCB, TAES, US). **Ocampo**: Along trail just above Cascada Basaseachic, 1880 m, *P.M. Peterson & Annable* 12523 (US); Approx. 10 mi E of Basaseachic on Hwy towards La Junta, 2110 m, *P.M. Peterson & Annable* 12541 (US). **Riva Palacio**: Cumbres de Majalca, 21.5 mi W of Hwy 45, 2200 m, *P.M. Peterson & Annable* 4575 (ENCB, US).

277. *Muhlenbergia villiflora* Hitchc., N. Amer. Fl. 17(6): 470. 1935.

Perennial; with scaly rhizomes. Culms 4–20(27) cm tall, to 2 mm thick, erect, wiry, smooth to nodulose roughened below the nodes; internodes smooth or nodulose. Sheaths 5–15 cm long, shorter than the internodes, about  $\frac{1}{2}$  the length of the internodes, glabrous to nodulose roughened, margins hyaline;



ligules 0.4–1.5 mm long, membranous, decurrent, apex acute, erose and toothed; blades 0.7–2 cm long, 0.2–1.2 mm wide, involute, arcuate-spreading, glabrous below and hirsutulous above. Panicles 1–5 cm long, 0.1–0.5 cm wide, narrow, contracted, loosely flowered, usually on an exerted peduncle; primary branches 0.2–1.1 cm long, appressed, ascending; pedicels 0.1–0.8(1.2) mm long, shorter than the spikelets, minutely setose. Spikelets 1.4–2.4 mm long; glumes 0.6–1.8 mm long, equal, unawned, glabrous, usually 1-veined, occasionally 2- to 3-veined,  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of the floret, green or purple, apex acute; lemmas 1.4–2.4 mm long, lanceolate, indistinctly 3-veined, mucronate or not, green or purplish, densely villous along the midvein and margins on the proximal  $\frac{1}{3}$ , the hairs 0.4–1 mm long, apex acute, the mucro 0.1–0.6 mm long; paleas 1.2–2.1 mm long, lanceolate, densely villous between the veins on the proximal  $\frac{2}{3}$ , apex acute; anthers 0.8–1.5 mm long, yellow, dark green, or purple. Caryopsis 1–1.4 mm long, ellipsoid to fusiform, dark brown.  $2n = 20, 22$ .

**DISTRIBUTION AND HABITAT.** *Muhlenbergia villiflora* occurs in openings primarily on alkaline soils derived from gypsum, rocky flats, and desert grasslands, usually in small, isolated populations at 1,500–2,100 m. In Mexico, *Muhlenbergia villiflora* var. *villiflora* also occurs in Durango, San Luis Potosí, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

278. *Muhlenbergia virescens* (Kunth) Trin., Gram. Unifl. Sesquifl. 193, t. 5a, f. 7. 1824.

*Muhlenbergia straminea* Hitchc., *Muhlenbergia curvula* Swallen.

FIGURE 182

Plants perennial; caespitose. Culms 25–70(100) cm tall, erect, rounded near the base; internodes glabrous. Sheaths 10–30 cm long, glabrous, stiff, becoming flat, ribbonlike or papery, and conspicuously spirally coiled when old; ligules (6)10–20 mm long, hyaline, acuminate, lacerate; blades 10–30 cm long, (0.5)1–4 mm wide, flat to involute, scabrous abaxially, spiculate adaxially. Panicles 10–25 cm long, 1–8 cm wide, loosely flowered, stramineous; primary branches 0.6–8 cm long, appressed or diverging up to 30° from the rachises; pedicels 0.2–5 mm long, scabrous. Spikelets 4–7 mm long, light grayish-green to white; glumes 3.5–6(7) mm long, scaberulous, unawned, rarely mucronate; lower glumes shorter than the upper glumes, 1-veined; upper glumes equaling or exceeding the florets, 3-veined, apex

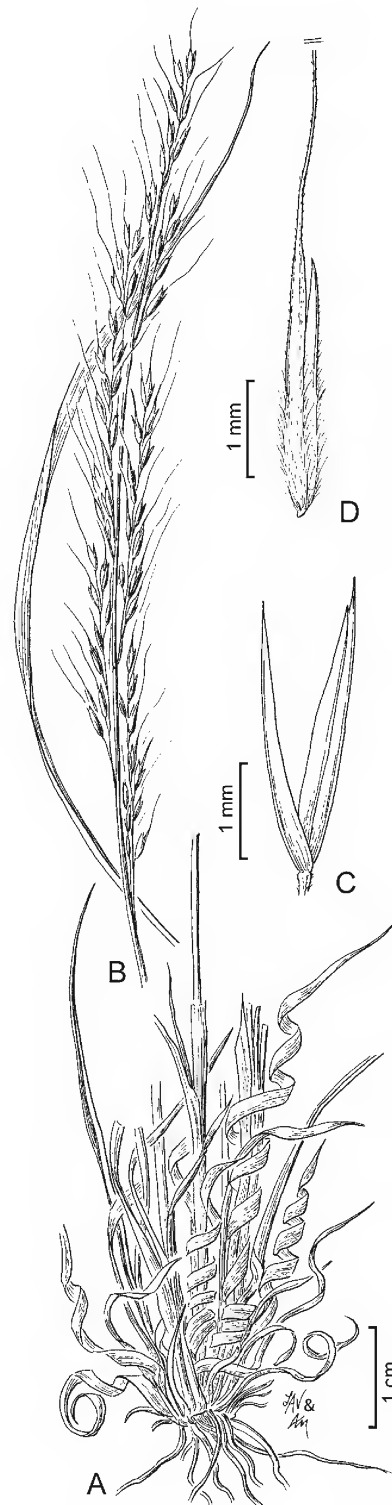


FIGURE 182. *Muhlenbergia virescens*. A. Habit. B. Inflorescence. C. Glumes. D. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

acuminate to acute; lemmas 3.5–5.5(6) mm long, lanceolate, pubescent on the lower ½ along the midveins and margins, hairs to 1 mm long, apex scabrous, acuminate, awned, the awns 12–27 mm long, flexuous; paleas 3.5–5.5 mm long, lanceolate, pilose between the veins, apex scaberulous, acuminate; anthers 2–3.5 mm long, purple. Caryopses 1.9–2 mm long, fusiform, light brown.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia virens* grows on rocky slopes, volcanic tuffs, canyon bottoms, and ridges, usually in open pine forests, at elevations of 1,800–2,600 m. It is known from the southwestern United States and north central Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 34 mi W of Balleza on road towards Guachochi, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13547 (US); 45 mi W of Balleza on road towards Guachochi, 2560 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13552 (US). **Batopilas:** Rancho Byarly, Sierra Charuco, 17–25 Apr 1948, 1700 m, *Gentry* 8143 (US); 10 mi E of jct to Batopilas, on road to Guachochi, 2500 m, *Y. Herrera, P.M. Peterson & Annable* 973 (CIIDIR, US); Brecha Samachique–Batopilas, 1800 m, *A. Rodríguez & J. Enrique* 1606 (CHAPA). **Bocoyna:** 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 2330 m, *Y. Herrera, P.M. Peterson & Annable* 963 (CIIDIR, US); NE of San Ignacio Arreco, in old road to Panalchic, 2466 m, *Bye* 3054 (MEXU); 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 10 Sep 1989, 2330 m, *P.M. Peterson, Annable & Y. Herrera* 8006 (US). **Buenaventura:** Hills near Buenaventura, 1950 m, *A.A. Beetle* M-7878 (MEXU). **Guachochi:** Ca 3.5 mi SE of Tónachic, 2200 m, *R. McVaugh* 11507 (US); 11 km al SW de Cuasarare, 2420 m, *M.E. Siqueiros* 790 (MEXU); Camino Guachochi–Creel, 5 km antes del entronque [before junction] a la Bufa, 2440 m, *E. Blanco* 1621 (MEXU); *M.E. Siqueiros* 1621 (MEXU); 8.5 km S of Cusarare on road to Guachochi, 24 Sep 1988, 2400 m, *P.M. Peterson & Annable* 5876, 5877 (US); 28.3 km S of Cusarare on road to Guachochi, entering Barranca del Cobre, 26 Sep 1988, 1900 m, *P.M. Peterson & Annable* 5913 (US); 19.3 km E of Guachochi, 26 Sep 1988, 2300 m, *P.M. Peterson & Annable* 5929 (US); 18 mi E of Guachochi on Mex 127 towards Balleza, 13 Sep 1989, 2680 m, *P.M. Peterson, Annable & Y. Herrera* 8073 (US); 5.8 mi N of Creel on road (Hwy 25) towards San Juanito, 2480 m, *P.M. Peterson & J. Cayouette* 15364 (US); 11.5 mi NW of Aboreachi on road towards Creel, 2500 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13554, 13556 (US); Parque Nacional Barranca del Cobre, 20 mi NW of Aboreachi on road towards Creel, 2390 m, *P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton* 13562 (US); Parque Nacional Barranca del Cobre, 65.3 km W of Guachochi on road towards Batopilas, 2410 m, *P.M. Peterson, Annable & Valdés-Reyna* 10861 (US). **Guadalupe y Calvo:** San Juan, Sierra Chinatú, 2700 m, *Correll & Gentry* 22922 (US). **Guerrero:** Waldungen der Sierra Madre Occidental, umgebrung [surroundings] von Sierra Colorada, 4 Apr 1906, *R. Endlich* 1210 (US); 1226 (US); About 5 mi SE Guerrero, 2130

m, *A.A. Beetle* M-3280 (MEXU). **Ignacio Zaragoza:** 20.3 km NE of Ignacio Zaragoza on Mex 23, 28 Sep 1989, 2400 m, *P.M. Peterson & R.M. King* 8150 (US). **Madera:** 12 mi SW of Chuhi-chupa, 2260 m, *Spellenberg & J. Zimmerman* 8952 (CIIDIR). **Nuevo Casas Grandes:** Al NE del campo Menonita, 1900 m, *M.A. López s.n.* (INEGI). **Ocampo:** 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8234 (US). **Temósachi:** Between Yeporema and Baviacora, 2250 m, *Correll & M.I. Johnston* 21634 (US).

**279. *Muhlenbergia wrightii*** Vasey ex J. M. Coul., *Man. Bot. Rocky Mt.* 409. 1885.

FIGURE 183

Caespitose perennial. Culms 15–60 cm tall, erect with knotty, thickened bases, flattened, strigose to hirsute below the nodes; internodes hirsute to almost glabrous. Sheaths 1.2–7.5 cm long, mostly shorter than the internodes, glabrous to scaberulous, compressed-keeled near the base; ligules 1–3(5) mm long, membranous, apex truncate; blades 1.4–12 cm long, 1–3 mm wide, flat to folded, slightly keeled, strigose adaxially glabrous to scaberulous abaxially. Panicles 5–16 cm long, 0.2–1.2 cm wide, narrow, densely flowered, contracted and spikelike; branches 0.3–2 cm long, ascending and tightly appressed; pedicels 0.1–1.4 mm long, shorter than the spikelets. Spikelets 2–3 mm long, dark green or plumbeous; glumes 0.5–1.6 mm long, about equal, 1-veined, mucronate, scaberulous along midvein, apex abruptly narrowed, acute or obtuse, the mucros 0.5–1 mm long; lemmas 2–3 mm long, lanceolate, mucronate, plumbeous, sometimes mottled with greenish-black areas and lighter areas, with short appressed pubescence along the margins and midvein on the proximal ½ to ¾, the hairs about 0.5 mm long, apex acute to acuminate, scaberulous, the mucro 0.3–1 mm long; paleas 1.9–3 mm long, lanceolate, short appressed pubescence between the veins on the proximal ¾, apex acute to acuminate, the veins sometimes mucronate, the mucros to 0.3 mm long; anthers 1.3–1.8 mm long, greenish. Caryopsis 1.2–2 mm long, fusiform, brownish.

**DISTRIBUTION AND HABITAT.** *Muhlenbergia wrightii* is found growing in gravelly prairies, grassy flats, rocky slopes, and open wet and dry meadows on granitic, sandstone, or limestone derived soils and is associated with *Pinus* spp., *Juniperus* spp., and *Quercus* spp. at 1,100–3,000 m. This species occurs in southwestern Utah, eastern Arizona, New Mexico, and western Colorado to northern Mexico in Baja California, Chihuahua, Durango, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Carichi:** Sánchez, 12 Oct 1910, *Hitchcock* 7693.5 (US). **Cuahutémoc:** 21 km W of Cuahutémoc, on Hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable* 9586 (US). **Gómez Farías:** Laguna Baviacora, 2400 m, *A. Saucedo s.n.* (INEGI). **Guerrero:** Santo Tomas, on railroad NW of San Isidro, 2000 m, *Pennell* 18989 (US); Miñaca, 13 Oct 1910, *Hitchcock* 7759 (US).

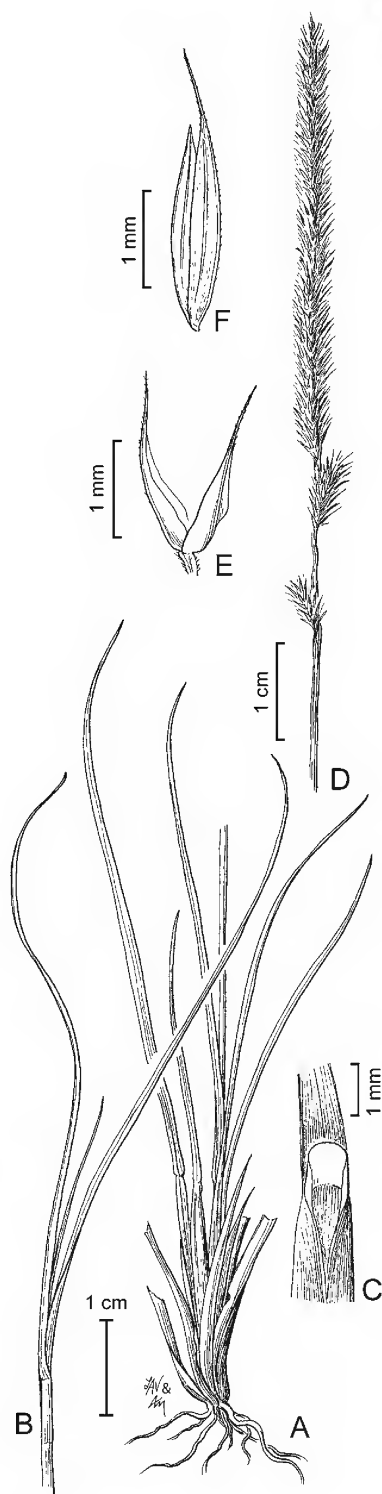


FIGURE 183. *Muhlenbergia wrightii*. A. Habit. B. Sheath and blades. C. Ligule. D. Inflorescence. E. Glumes. F. Floret. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

### **Munroa Torr.**

Annual; stoloniferous, mat-forming; stolons 2–8 cm long, terminating in involucre of leaves from which new culms arise. Culms 3–15(30) cm. Leaves mostly basal, sometimes with a purple tint; sheaths with a tuft of hairs at the throat; auricles absent; ligules of hairs; blades linear, usually involute, sometimes flat or folded, with white, thickened margins, apex sharply pointed. Inflorescences terminal, capitate panicles of spike-like branches; branches almost completely hidden in a subtending leafy bract, with 2–4 subsessile or pedicellate spikelets. Spikelets laterally compressed, with 2–10 florets; lower florets bisexual or pistillate; terminal florets sterile; disarticulation above the glumes or beneath the leaves subtending the branches. Glumes shorter than the spikelets, keeled, 1-veined, unawned; lower glumes usually present on all spikelets (absent from all spikelets in *M. mendocina*); upper glumes absent or reduced on the terminal spikelet; lemmas with a pilose tuft of hairs along the margins at midlength, membranous or coriaceous, 3-veined, lateral veins occasionally shortly excurrent, apex emarginate or 2-lobed; paleas glabrous, smooth; lodicules present or absent, truncate; anthers 2 or 3, yellow; style branches elongate, 2(3), barbellate. Caryopsis dorsally compressed.  $\times = 7$  or 8.

*Munroa*, a genus of five species, is endemic to the Western Hemisphere. One species occurs in Chihuahua.

280. *Munroa squarrosa* (Nutt.) Torr., Pacif. Railr. Rep. 4(5): 158. 1857.

FIGURE 184

Stolons slender. Culms 3–15(30) cm long, highly branched, scabrous, often minutely puberulent. Sheaths shorter than the internodes, membranous; ligules 0.5–1 mm long; blades 1–5 cm long, 1–2.5 mm wide. Spikelets 6–8(10) mm long, with 3–5 florets; glumes 2.5–4.2 mm long, first 1–2 spikelets subequal, narrow, 1-veined, acute; glumes of upper spikelets unequal; lower glumes reduced or even absent in the terminal spikelets; lemmas in lower spikelets scaberulous, lanceolate, midvein excurrent, forming a stout, scabrous awn, the awn 0.5–2 mm long, lateral veins with a tuft of hairs on the margins near midlength, excurrent; anthers 1–1.5 mm long.  $2n = 16$ .

**DISTRIBUTION AND HABITAT.** *Munroa squarrosa* grows in dry, open areas, usually in sandy soil or disturbed sites, from Saskatchewan and Alberta south to Chihuahua, Mexico.

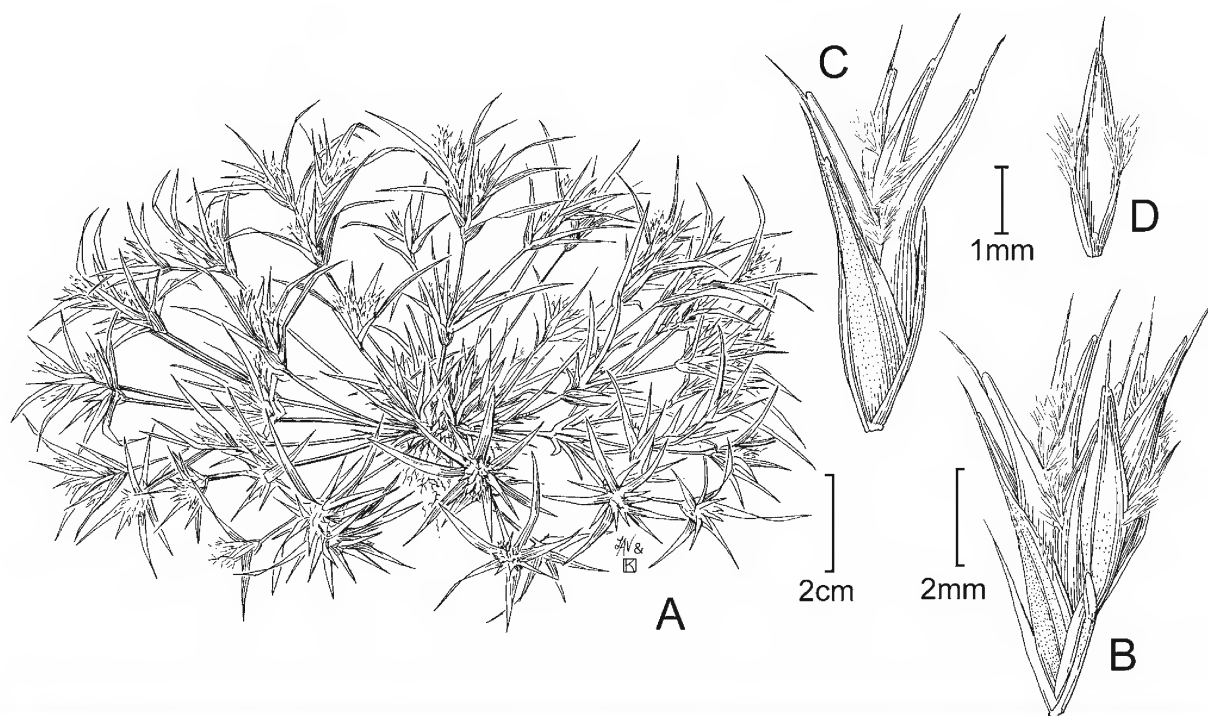


FIGURE 184. *Munroa squarrosa*. A. Habit. B. Inflorescence branch. C. Lower spikelet. D. Floret, ventral view. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Juárez: aprox. 6 km al S del poblado [village] Samalayuca, 9 Sep 1995, en arenas profundas [deep sands], 1200 m, R. Corral & P. Olivas RCD6325 (UACJ); carr. [hwy] No. 2 Juárez–Janos, km 42, 11 Aug 1996, matorral de médanos [dune scrub], 1250 m, P. Olivas, R. Rivas & I. Enríquez POS793 (UACJ); near Ciudad Juárez, 28 Sep 1902, Sandy soil, C.G. Pringle 11236 (MEXU); km 320 carr. Chihuahua–Cd. Juárez, 14 Oct 1990, zona de médanos [dune area], 1280 m, A. González s/n (MEXU); 2.3 (rd) mi E of Samalayuca, 13 Sep 1972, in sandy flats and small dunes, 4200 ft, J. Henrickson 7490 (MEXU); 4.1 (rd.) mi N of Samalayuca along Hwy 45, 13 Sep 1972, sand dune area, 4700 ft, J. Henrickson 7434 (MEXU).

### *Nassella* Desv.

Plants usually perennial, rarely annual; caespitose, occasionally rhizomatous. Culms branched at the upper nodes, branches flexible; prophylls not evident, shorter than the sheaths. Leaves mostly basal, not overwintering; sheaths open; cleistogenes sometimes present; auricles absent; ligules membranous, sometimes pubescent or ciliate; blades basal, apex narrowly acute to acute, not

sharp, flag leaf blades present, bases about as wide as the top of the sheaths. Inflorescences terminal panicles, sometimes partially included at maturity. Spikelets with 1 floret; rachillas not prolonged beyond the base of the floret; disarticulation above the glumes, beneath the floret. Glumes longer than the floret, narrowly lanceolate or ovate, basal portion usually purplish at anthesis, color fading with age, (1)3- to 5-veined, sometimes awned; florets usually terete, sometimes slightly laterally compressed; calluses blunt or sharp, glabrous or antrorsely strigose; lemmas usually papillose or tuberculate, at least distally, sometimes smooth throughout, glabrous or variously hairy, strongly convolute, wrapping 1.2–1.5 times around the caryopsis, apex not lobed, fused distally into crowns, these often evident by their pale color and constricted bases; crowns mostly glabrous, rims often bearing hairs with bulbous bases; awns terminal, centric or eccentric, deciduous or persistent, usually twice-geniculate, second geniculation often obscure; paleas up to ½ as long as the lemmas, glabrous, without veins, flat; lodicules 2 or 3, if 3, the third somewhat shorter than the other 2; anthers 1 or 3, if 3, often of 2 lengths, penicillate; ovaries glabrous; styles 2, bases free. Caryopsis glabrous, not ribbed.  $x = 7, 8$ .

*Nassella* used to be interpreted as a genus of approximately 14 species but now has about 125 species primarily in South America.



281. *Nassella mucronata* (Kunth) R. W. Pohl, Taxon 39(4): 611. 1990.

Perennial. Culms 60–100 cm tall, erect or geniculate, ascending, nodes pubescent. Sheaths glabrous, margins hairy; ligules 0.5–1 mm long, membranous; blades 10–20 cm long, 1–3 mm wide, flat or involute, pubescent, sparsely hairy on both sides. Panicles 10–30 cm long, open, linear, dense, nodding, branches appressed or ascending. Spikelets 8–10 mm long, solitary, pedicelled, lanceolate, subterete, disarticulating below each fertile floret, callus about 2 mm long, elongated, pubescent (tawny), acute; glumes 25–40 mm long, persistent, equal, exceeding apex of florets, thinner than fertile lemma, oblong, membranous, purple; lower glumes 3-veined, primary vein scabrous, apex acuminate; upper glumes 5-veined, apex acuminate; lemmas 5–6 mm long, 1 mm wide, 5-veined, oblong, subterete, coriaceous, dark brown, papillose, rough above, pubescent, hairy below, margins convolute and covering most of palea, apex with a short cylindrical neck, surmounted by a ring of hairs, the hairs 0.5 mm long, awned, the awn 35–50 mm long, 2-geniculate, with a twisted column, the column 9–10 mm long, middle segment of awn 8–9 mm long; paleas 2-veined; anthers 3, 4–4.5 mm long.

**DISTRIBUTION AND HABITAT.** *Nassella mucronata* is known from Mexico and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Reported in Espejo Serna et al. (2000).

### *Oplismenus* P. Beauv.

Annual or perennial. Culms weak, trailing on the ground, branching. Leaves cauline; ligules membranous and ciliate, or of hairs; blades lanceolate. Inflorescences terminal, panicles of unilateral branches, spikelets paired (but the first spikelet sometimes reduced), rachises and branches terminating in a spikelet; branches persistent; disarticulation below the glumes. Spikelets dorsally compressed, not sunken into the rachis, lacking subtending bristles, with 2 florets. Lower glumes awned; upper glumes not ciliate on the margins, unawned or with awns shorter than those of the lower glumes, awns of both glumes often becoming

viscid; lower florets sterile or staminate, lower lemmas acute to short-awned, lower paleas present or absent; upper florets bisexual; upper lemmas papery to leathery, glabrous, smooth, unawned, white or yellow at maturity; upper paleas similar to the upper lemmas.  $x = 9$ .

*Oplismenus* is a genus of 11 closely related species that grow in shady, mesic forests of tropical and subtropical regions.

282. *Oplismenus burmannii* (Retz.) P. Beauv., Ess. Agrostogr. 54: 169. 1812. *Panicum burmannii* Retz., Observ. Bot. 3: 10. 1783.

**Annual;** usually slender. Culms (15)25–45(65) cm tall; **nodes** hairy; **internodes** grooved, usually hairy in the grooves, less so on the nodes. **Leaves** light green; **sheaths** glabrous or sparsely hairy, the edges ciliate; **ligules** 0.6–1.2(1.8) mm long, ciliate; **blades** (2)3–7(8) cm long, 6–13 (16) mm wide, ovate-oblong to oblong-lanceolate, usually hairy, midvein weak, with 2–3 lateral veins on each side, cross venation usually visible. **Panicles** (3)4–8(10) cm long, sometimes hairy, with 3–10 primary branches; lower primary branches (0.2)0.5–1.5(3) cm long, with (3)10–20(25) spikelets, spikelets borne in pairs, usually encircled at the base with hairs almost as long as the spikelets. **Spikelets** (2)2.8–4.5 mm long, usually densely hairy, sometimes glabrous, flattened to rounded on the back; **lower glumes** (1.3)1.9–2.4 mm long, 0.7–0.9(1.2) mm wide, oblong-oval, densely hairy, with 3–5(7) veins, awned, the awns (3)6–11(15) mm long, frail, whitish, and scabrous; upper glumes (1.5)2–2.3 mm long, (0.7)–1.2(1.5) mm wide, similar to the lower glumes in shape, fairly densely hairy, with 5–7 veins, awned, the awns (0.4)3–6(9) mm long, frail, whitish, and scabrous; **lower lemmas** (2)2.6–3.5 mm long, (1)1.7–2.4 mm wide, oblong, with (5)7–9(11) veins, mucronate or short-awned; lower paleas absent. Caryopsis oblong-lanceolate.

*Oplismenus burmannii* is a pantropical species that is most abundant in Africa. In Mexico it has two varieties: *O. burmannii* var. *burmannii* and *O. burmannii* var. *nudicaulis* (McVaugh, 1983), and only the former variety is known from Chihuahua. However, we include a key to both varieties since *O. burmannii* var. *nudicaulis* is known from eastern Sonora near the boundary of Chihuahua (P.M. Peterson & Saarela 22107).

### KEY TO VARIETIES OF *OPLISMENUS BURMANNII*

1. Spikelets (2)2.5–3.5 mm long, the sterile lemma narrowed to an acute point, mostly with weak converging veins; caryopsis essentially filling and distending the lemma; uplands, mostly above 1,500 m . . . . . *O. burmannii* var. *burmannii*
1. Spikelets (3)3.5–4.5 mm long, the sterile lemma prolonged into a cylindric and often arcuate tip with 9 strong, raised, parallel veins; caryopsis not extending into the tip of the lemma; mostly lowlands and foothills . . . . . *O. burmannii* var. *nudicaulis* (Vasey) McVaugh

#### *Oplismenus burmannii* var. *burmannii*

**DISTRIBUTION AND HABITAT.** *Oplismenus burmannii* var. *burmannii* is known from Mexico to South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chinipas: Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes

with oaks and pines, 1540 m, P.M. Peterson & J.M. Saarela 22122 (US). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” in the barranca [canyon] to W of falls, 4 Oct 1986, 1800 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8826 (NMC).



**Otatea (McClure & E. W. Sm.)  
C. E. Calderón & Soderstr.**

Perennial bamboos of medium size, clump-forming with pachymorph rhizomes. Culms woody, erect, internodes cylindrical, solid becoming partially fistulose, glabrous, branches 3 per node at the middle of the culm. Sheaths persistent on the lower nodes, tardily deciduous on the upper nodes; ligules membranous, auriculate; blades lanceolate, flat, the blades of branches with pseudopetioles. Inflorescence a panicle; spikelets with several florets; glumes 1 or 2, short-awned; florets bisexual; upper florets reduced; rachilla internodes scabrous, ciliate; lemma awned; palea with a dentate apex. Fruit a small, dry caryopsis.

*Otatea* has 11 species known from tropical areas, 10 are endemic to Mexico, and 1, *O. fimbriata* Soderstr., is wide ranging from Mexico and Central America to Columbia (Juziewicz et al., 1999; Ruiz Sanchez et al., 2011, 2015; Ruiz Sanchez and Castro Castro 2016).

283. *Otatea acuminata* (Munro) C. E. Calderón & Soderstr., Smithsonian Contr. Bot. 44: 21. 1980. *Arundinaria acuminata* Munro, Trans. Linn. Soc. London 26(1): 25. 1868.

Rhizomatous perennial. Culms 2–10 m tall, 1–2.5 cm thick, erect, solid on young plants and fistulose on mature individuals; internodes green-yellowish or purple. Leaves cauline; sheaths appressed-hirsute on the upper ½, setose on the shoulders, the hairs about 3 mm long; ligules 0.3–0.6 mm long, truncate; blades 6–15 cm long, 0.5–1.1 cm wide, linear to narrowly lanceolate, glabrous adaxially, abaxially pilose near the base, deciduous at the ligule. Panicles 5–10 cm long; pedicels glabrous. Spikelets 3–4 cm long, 3- to 7-flowered; rachilla internodes 4–7 mm long, zigzag, visible between the lemmas and disarticulating at maturity, pubescent; glumes unequal, awned, the awns 1–3 mm long; lower glumes 2.5–4.5 mm long excluding the awn; upper glumes 3.5–6 mm long; lemmas 11–15 mm long, 9- to 11-veined, pilose on margins, lanceolate, keeled with a terminal awn, the awn 3–6 mm long; paleas 9–11 mm long, oblong, pubescent on the keels and between, apex truncate and narrow; anthers 5–6.5 mm long. Caryopsis 6–8.5 mm long, linear.

There are two subspecies; only *Otatea acuminata* subsp. *aztecorum* (McClure & E. W. Sm.) R. Guzmán, Anaya & Santana is present in Chihuahua.

**DISTRIBUTION AND HABITAT.** *Otatea acuminata* subsp. *aztecorum* grows in wet places in tropical forests and is endemic to the Mexican Pacific slopes, the Trans-Mexican

Volcanic Belt, Oaxaca, Puebla, Querétaro, and Veracruz at 150–2,000 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** 37.3 km al NE de Batopilas, rumbo [course] a Quirare, 26 Oct 2002, 1860 m, P. Tenorio & J. Rodríguez 22429 (US). **Guachochi:** 1–2 km S of Río Osichi and Río Basihuare jct, 1 Sep 2003, bosque [forest] de *Quercus–Pinus*, 1600 m, P.M. Peterson & P. Catalán 17638 (CIIDIR). **Urique:** Guapalayna, 19 Apr 2002, R. Bye, M. Mendoza, D. Castro, J. Rodríguez, P. Tenorio & R. Alvarado 28690 (US).

**Panicum L.**

Annual or perennial. Culms herbaceous, sometimes hard and almost woody, or woody, simple or branched, bases not cormlike; internodes solid, spongy, or hollow. Leaves cauline, basal, or both, basal leaves not forming a winter rosette; ligules membranous, usually ciliate; blades filiform to ovate, flat to involute, glabrous or hairy. Inflorescence terminal on the culms and branches, sometime axillary, terminal panicles typically appearing after midsummer; sterile branches and bristles absent; disarticulation usually below the glumes, sometimes at the base of the upper florets, if at the base of the upper florets, then the florets not very plump at maturity. Spikelets dorsally compressed, sometimes subterete or laterally compressed, awnless. Glumes usually unequal, herbaceous, glabrous or hairy, rarely tuberculate or glandular, apex not or only slightly gaping at maturity; lower glumes minute to almost equaling the spikelets, 1- to 9-veined, truncate, acute, or acuminate; upper glumes slightly shorter to much longer than the spikelets, 3- to 13(15)-veined, bases rarely slightly sulcate, apex rounded to attenuate; lower florets sterile or staminate; lower lemmas similar to the upper glumes; lower paleas absent or shorter than the lower lemmas and hyaline; upper floret bisexual, ⅔ to as long or exceeding the upper glume, sessile or stipitate, apex acute, glabrous or hairy; upper lemmas usually more or less rigid and chartaceous-indurate, usually shiny, glabrous, and smooth, sometimes pubescent, sometimes verrucose or faintly transversely rugose, margins involute, usually clasping the paleas, rarely with basal wings or lunate scars, apex obtuse, acute, apiculate, or occasionally with small green crests; upper paleas striate, rarely transversely rugose; lodicules 2; anthers usually 3. Caryopsis smooth; pericarp thin; endosperm hard, without lipid, starch grains simple or compound, or both; hila round or oval.  $x = 9$  (usually), sometimes 10, with polyploid and dysploid derivatives.

*Panicum* has approximately 330 species of cosmopolitan distribution.

**KEY TO SPECIES OF PANICUM**

1. Plants robust, greater than 1 m tall; plants perennial and generally rhizomatous; cultivated in pastures.
  2. Culms with bases strongly knotty; the diameter of the nodes frequently twice the diameter of the internodes; spikelets 2.5–3 mm long, arranged in pairs, or terminal spikelets . . . . . *P. antidotale*
  2. Culms with bases not knotty; nodes and internodes of similar diameter; spikelets 3–4 mm long, not in pairs.

3. Upper florets rugulose, elliptical, minutely puberulent at the apex; lower glume less than  $\frac{1}{2}$  as long as the spikelet, subacute, 3-veined; spikelets 3–3.4 mm long ..... *P. plenum*
3. Upper florets smooth, ovate, glabrous; lower glume more than  $\frac{1}{2}$  as long as the spikelet, acuminate, 3- to 5-veined; spikelets 3–5(6) mm long ..... *P. virgatum*
1. Plants not robust, less than 1 m tall; annual or perennial but never rhizomatous; never cultivated in pastures.
4. Spikelets 1.1–1.3 mm long; plants clearly annual ..... *P. trichoides*
4. Spikelets 2 mm long or more; perennial or appearing annual.
5. Spikelets 3.7–5.8(6) mm long; upper glume and lemma 11–15-veined; culms erect, not geniculate.
6. Spikelets 3.7–4.2 mm long; panicle branches spreading and flexuous, naked near base with 1 to 3 spikelets near the tips ..... *P. lepidulum*
6. Spikelets 4.5–6 mm long; panicle branches ascending or spreading, never flexuous, branches few-flowered or floriferous to base.
7. Lower glumes 2–2.7 mm long, acute or obtuse; rachilla between the glumes inconspicuous; panicle branches floriferous to base, ascending and appressed ..... *P. decolorans*
7. Lower glumes 2.8–4.2 mm long, acuminate; rachilla between the glumes elongate; panicle branches few-flowered, naked near lower  $\frac{1}{2}$ , spreading and ascending ..... *P. parcum*
5. Spikelets 2–3.5(4) mm long (4 mm in *P. pampinosum*); upper glume and lemma 7- to (9)-veined (lemma 9-veined in *P. pampinosum*); culms decumbent and geniculate.
8. Lower glume  $\frac{1}{4}$  to  $\frac{1}{3}$  as long as the spikelet, apex obtuse to acute.
9. Upper floret 0.2–0.5 mm shorter than lemma of the lower floret ..... *P. vaseyanum*
9. Upper floret 1–1.3 mm shorter than lemma of the lower floret ..... *P. dichotomiflorum*
8. Lower glume  $\frac{1}{2}$  or more as long as the spikelet, apex acute or acuminate.
10. Perennial, culms hardened at the base; blades generally glaucous and glabrous ..... *P. ballii*
10. Annual, culms usually not hardened at the base; blades papillose-hirsute to pilose at least on the base and margins.
11. Panicle spiciform to subspiciform, the primary branches appressed to ascending ..... *P. pampinosum*
11. Panicle lax, diffuse to contracted, the primary branches divergent.
12. Upper floret short stipitate with 2 cartilaginous extensions at the base of the lemma; blades glabrous to sparsely papillose-hirsute, the base rounded to subcordate ..... *P. alatum*
12. Upper floret neither stipitate nor with cartilaginous extensions; blades densely papillose-hirsute, the base rounded to cordate-clasping ..... *P. hirticaule*

284. *Panicum alatum* Zuloaga & Morrone, Ann. Missouri Bot. Gard. 83(2): 224–226, f. 15. 1996.

Caespitose annual. Culms 25–95 cm tall, erect to geniculate, branched at base, generally glabrous. Leaf sheaths papillose-hirsute with deciduous hairs; ligules 0.7–1.8 mm long, membranous, ciliate, the cilia 0.5–1.5 mm long; blades 5–18 cm long, 3–17 mm wide, flat, linear-lanceolate, glabrous to sparsely papillose-hirsute, the base rounded to subcordate. Panicles 5–25 cm long, terminal and axillary, diffuse; branches 4.5–12 cm long, lax, ascending to divergent; rachis scabrous. Spikelets 2.4–3.5 mm long, 0.7–1.5 mm wide, elliptic, glabrous, acute to acuminate; lower glume 1.5–1.8(2.5) mm long,  $\frac{3}{4}$  as long as the spikelet, 5- to 7-veined, ovate-acuminate, separated from the upper glume by an internode of 0.3 mm long; upper glume 2.2–2.7(3.3) mm long, 7- to 9(11)-veined; lower floret neuter; inferior lemma similar to the upper glume; inferior palea lacking, or if present 0.2–0.9 mm long, lanceolate, bilobed; upper floret perfect, short stipitate with 2 cartilaginous extensions at the lemma base, whitish, opaque, markedly papillose over the entire surface or only at apex; palea oblong-ovate, apex abruptly acute; anthers 0.9–1.1 mm long.  $n = 9$ .

**DISTRIBUTION AND HABITAT.** *Panicum alatum* occurs in open areas, sometimes at lake margins. This taxon has

three varieties; *Panicum alatum* var. *minus* (Anderson) Zuloaga & Morrone is reported from Chihuahua (Espejo Serna et al., 2000) and ranges from the United States to South America. It was described from Baja California but is uncommon in Mexico.

285. *Panicum antidotale*\* Retz., Observ. Bot. 4: 17. 1786.

Caespitose perennial; rhizomatous, the rhizomes about 1 cm thick, knotted, pubescent, with large, scalelike leaves. Culms 50–300 cm tall, 2–4 mm in diameter, often compressed, erect or ascending, hard, becoming almost woody; nodes swollen, glabrous or pubescent; internodes glabrous and glaucous. Sheaths shorter than or equal to the internodes, not keeled, glabrous or the lower sheaths at least partially pubescent, the hairs papillose-based; ligules 0.3–1.5 mm long; blades 10–60 cm long, 3–20 mm wide, elongate, flat, scabrous below and along margins, occasionally pubescent above near the base with prominent, white midveins, bases rounded to narrowed. Panicles 10–45 cm long,  $\frac{1}{2}$  as wide as long, open or somewhat contracted with many spikelets; branches 4–12 cm long, ascending to spreading, inserted opposite or alternately along the rachis; pedicels 0.3–2.5 mm long, scaberulous to scabrous, appressed to diverging less than  $45^\circ$  from the branch axes. Spikelets

2.4–3.4 mm long, 1–1.3 mm wide, ellipsoid-lanceoloid to narrowly ovoid, often purplish, glabrous, acute; lower glumes 1.4–2.2 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the spikelets, 3- to 5-veined, obtuse; upper glumes and lower lemmas subequal, glabrous, 5- to 9-veined, margins scarious, acute; lower florets staminate; upper florets 1.8–2.8 mm long, 0.9–1.1 mm wide, smooth, lustrous, acute.  $2n = 18, 36$ .

**DISTRIBUTION AND HABITAT.** *Panicum antidotale* is found on grassy flats and is cultivated at Rancho La Campana. This species is native to India and has been introduced to the Western Hemisphere.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: Rancho Experimental La Campana, 82 km al N de la ciudad de Chihuahua, 26 Aug 1978, 1550 m, C.A. Fernández s.n. (ENCB); La Campana, 24 Sep 1976, Jardín de observación forrajera [forage observation garden], 1500 m, S. González 769 (RELC).

**286. *Panicum decolorans*** Kunth, Nov. Gen. Sp. (quarto ed.) 1: 100. 1815.

Caespitose annual. Culms 30–60 cm tall, internodes distally pilose. Sheaths hirsute with tubercle-based hairs; ligules 1 mm long, a ciliate membrane; blades 8–15 cm long, 7–10 mm wide. Panicles 10–18 cm long with branches floriferous throughout, ascending and appressed, somewhat narrow. Spikelets 4.5–6 mm long, ovate, dorsally compressed, acute, falling entire, pedicelled; glumes as long as the florets, unequal, ovate, membranous, thinner than fertile lemma, apex acute; lower glumes 2–2.7 mm long, 5- to 7-veined, acute to obtuse; upper glume 4.5–6 mm similar to lemma of the sterile floret; lemma of sterile floret as long as the spikelet, ovate, membranous, acute; sterile floret palea  $\frac{1}{4}$  as long as the lemma; fertile lemma 2.3–3.5 mm long, 1.5 mm wide, elliptic, dorsally compressed, indurate, pallid, shiny, margins involute; fertile palea involute, indurate; anthers 2.1 mm long, dark brown. Caryopsis 2–2.5 mm long.  $n = 16, 18$ .

**DISTRIBUTION AND HABITAT.** *Panicum decolorans* grows in grasslands. It is endemic to Mexico, from Chihuahua, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Oaxaca, Puebla, Querétaro, Sinaloa, and San Luis Potosí (Espejo Serna et al., 2000; Herrera Arrieta and Cortés Ortiz, 2010).

**287. *Panicum dichotomiflorum*\*** Michx., Fl. Bor.-Amer. 1: 48. 1803.

Annual or short-lived perennial; usually terrestrial, sometimes aquatic but not floating. Culms 5–200 cm tall, 0.4–3 mm thick, decumbent to erect, commonly geniculate to ascending, rooting at the lower nodes when in water, simple to divergently branched from the lower and middle nodes, usually succulent, slightly compressed, glabrous; nodes usually swollen, sometimes constricted on robust plants, glabrous; internodes glabrous, shiny, pale green to purplish. Sheaths compressed, inflated, sparsely pubescent near the base, elsewhere mostly glabrous, sparsely pilose, or hispid,

hairs sometimes papillose-based, margins or throat ciliate with papillose-based hairs; ligules 0.5–2 mm long; blades 10–65 cm long, 3–25 mm wide, glabrous or sparsely pilose, often scabrous near the margins, midribs stout, whitish. Panicles 4–40 cm long, diffuse, lax, with a few spikelets; branches to 15 cm long, ascending to spreading, stiff, scabrous, alternate or opposite, occasionally verticillate; pedicels 1–6 mm long, sharply 3-angled, scabrous, apex expanded to cuplike, appressed mostly to the abaxial side of the branches. Spikelets 1.8–3.8 mm long, 0.7–1.2 mm wide, ellipsoid to narrowly ovoid, light green to red-purple, glabrous, acute to acuminate; lower glumes 0.6–1.2 mm long,  $\frac{1}{4}$ – $\frac{1}{3}$  as long as the spikelets, 0- to 3-veined, obtuse to acute; upper glumes and lower lemmas similar, exceeding the upper florets by 0.3–0.6 mm long, 7- to 9-veined; lower paleas vestigial to almost as long as the lower lemmas; lower florets sterile; upper florets 1.4–2.5 mm long, 0.7–1.1 mm wide, narrowly ellipsoid, smooth, shiny, stramineous to nigrescent, with pale veins.  $2n = 36, 54$ .

**DISTRIBUTION AND HABITAT.** *Panicum dichotomiflorum* grows in open, often wet, disturbed areas such as cultivated and fallow fields, roadsides, ditches, open stream banks, receding shores, clearings in flood plain woods, and sometimes in shallow water. It is probably native throughout the eastern United States and adjacent Canada but introduced elsewhere. This species is reported for Chihuahua in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

**288. *Panicum ballii*** Vasey, Bull. Torrey Bot. Club 11(6): 61. 1884.

FIGURE 185

Caespitose perennial. Culms 10–100 cm tall, 2–10 mm thick, erect, simple or sparingly branched basally; nodes sericeous, pilose or glabrous; internodes usually glaucous. Leaves often crowded basally; sheaths rounded, glabrous or hirsute, hairs fragile, papillose-based, margins sometimes ciliate distally; ligules 0.6–2 mm long; blades 4–23 cm long, 1–10 mm wide, erect to spreading, flat or sometimes involute (on sterile branches), often curling at maturity, glaucous, abaxial surfaces sometimes with prominent papillae along the midribs, bases rounded or narrowing to the sheaths, margins cartilaginous, ciliate basally, scaberulous elsewhere, apex acute. Terminal panicles 7–31 cm long, 3–15 cm wide; rachises glabrous, tending to break at maturity; branches usually alternate, slender, stiff, ascending to divergent; pedicels 1–15 mm long, appressed. Spikelets 2.1–4.2 mm long, 0.8–1 mm wide, usually ovoid, glabrous; lower glumes 1.2–2.4 mm long,  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the spikelets, attenuate; upper glumes and lower lemmas similar, 7- to 11-veined, acuminate, extending 0.3–1.2 mm beyond the upper florets; lower florets sterile; lower paleas 0.8–2 mm long; upper florets 1.5–2.4 mm long, 0.7–1.2 mm wide, ovoid to ellipsoid, smooth, nigrescent.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Panicum ballii* grows on sandy, gravelly, or rocky land, including roadsides, pastures, rangeland, oak and pine savannahs, chaparral, and moist

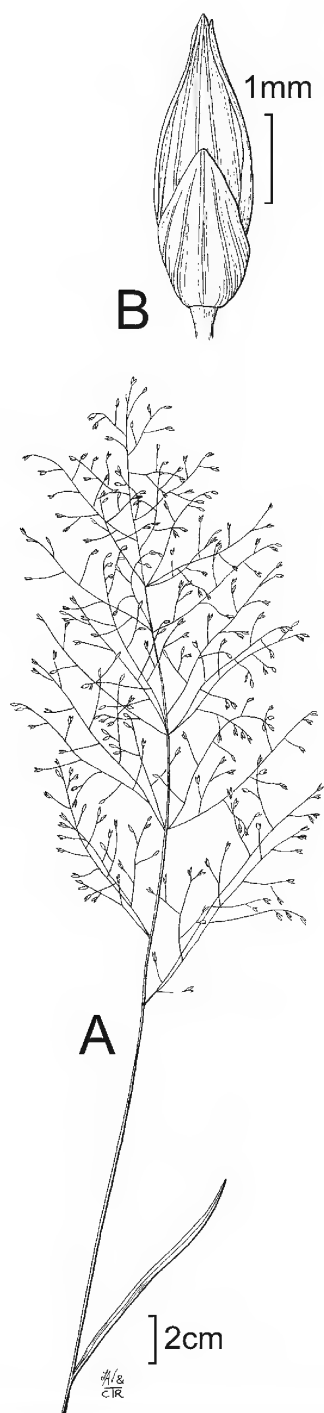


FIGURE 185. *Panicum hallii*. A. Culm and inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

areas in deserts and on mesas. Its range extends from the southwestern United States to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5337 (UACJ). **Buenaventura:** 10 km al SE de Buenaventura, 23 Oct 74, matorral [scrub], **Valdés-Reyna VR-743** (RELC). **Chihuahua:** La Campana; 1 km Pte. carr. [hwy] Panamericana, 5 sep 73, Pastizal [pastureland], 1570 m, **Valdés-Reyna VR-68** (RELC). **Janos:** 10 km antes [before] de Janos, 23 Oct 74, matorral, **Valdés-Reyna VR-754** (RELC). **Jiménez:** Reserva de la Biosfera de Mapimí, dunas de arena [sand dunes] La Soledad, 9 Jul 1997, matorral xerófilo [xerophilous scrub], 1140 m, A. García 2702 (CIIDIR); 20 sep 1999, A. García 3682 (CIIDIR); 13 km S of Jimenez, 30 Jul 1939, L. H. Harvey 1342 (US); Sta. Eulalia Mts, 1885, C.G. Pringle 376 (ENCB, US); 2 km N of San Antonio, 16 Aug 1939, L. H. Harvey 1516 (US). **Manuel Benavides:** 1 mi E of Pozo de Villa along road from Ojinaga to Castillon, via La Mula, Trincheras, Piramide and San Salvador, 10–12 Aug 1941, I.M. Johnston 817 (US).

289. *Panicum hirticaule* J. Presl, Reliq. Haenk. 1(4–5): 308. 1830.

FIGURE 186

Annual. Culms 11–110 cm long, erect to decumbent; nodes short hirsute or glabrous. Sheaths shorter than the internodes, greenish to purplish, glabrous or with papillose-based hairs, ciliate on 1 margin, glabrous on the other; collars hirsute; ligules 1.5–3.5 mm long, of hairs; blades 3–30 cm long, 3–30 mm wide, flat, usually densely to sparsely hirsute, hairs papillose-based, sometimes glabrous, bases rounded to cordate-clasping, margins ciliate, cilia papillose-based, apex acute. Panicles 9–30 cm long, 5–8 cm wide, erect or nodding, partially included to well-exserted, rachises glabrous or sparsely hirsute basally; primary branches usually alternate to opposite, divergent, secondary branches and pedicels confined to the distal  $\frac{2}{3}$ ; pulvini inconspicuous; secondary branches appressed; pedicels 9–27 mm long, appressed. Spikelets 1.9–4 mm long, 0.8–1 mm wide, ovoid to almost spherical, often reddish-brown, glabrous, veins prominent, scaberulous, apex abruptly acuminate; lower glumes 1.3–2.4 mm long,  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the spikelets, 3- to 5-veined; upper glumes 1.8–3.3 mm long, 7- to 11-veined; lower florets sterile; lower lemmas similar to the upper glumes, 9-veined; lower paleas 0.4–0.9 mm long; upper florets 1.5–2.4 mm long, 0.4–0.8 mm wide, ellipsoid, smooth or conspicuously papillate, shiny, stramineous, often with a lunate scar at the base.

**DISTRIBUTION AND HABITAT.** *Panicum hirticaule* grows in rocky or sandy soils in waste places, roadsides, ravines, and wet meadows along streams. Its range extends from southeastern California and southwestern Texas southward through Mexico, Central America, Cuba, and Hispaniola to western South America and Argentina. Two varieties are known from Chihuahua (Zuloaga and Morrone 1996).

KEY TO VARIETIES OF *PANICUM HIRTICAULE*

1. Spikelets 1.9–2.8 (3.3) mm long; upper floret stramineous, shiny, smooth with simple papillae on the apex of the lemma ..... *P. hirticaule* var. *hirticaule*  
 1. Spikelets 2.4–3.5 mm long; upper floret grayish, opaque with simple papillae on the entire surface of the lemma ..... *P. hirticaule* var. *verrucosum*

*Panicum hirticaule* var. *hirticaule*

SPECIMENS EXAMINED. MEXICO. Chihuahua. **Ahumada:** 12 km al N de Flores Magón, 7 Oct 1995, matorral desértico [desert scrub], 1180 m, R. Corral, P. Olivas & J.O. Torres RCD6490 (UACJ). **Ascención:** SW of Cd. Juárez, 6.8 (rd) mi N of Guzman, 14 Sep 1974, J. Henrickson 14098 (US). **Buenaventura:** km 40 San Buenaventura–El Carmen 25 Oct 1954, *Hern.-Xol. & C. Tapia* N-231 (US). **Camargo:** rd from Mestehías NE to Ojinaga, 26 Sep 1938, I.M. Johnston 7992 (US); 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, L. H. Harvey 1378 (US). **Casas Grandes:** E.W. Nelson 6355 (US); Casas Grandes, 25 Aug 1899, E.W. Nelson 6297 (US). **Chihuahua:** Rancho La Presa, 21 Oct 1954, 1100 m, *Hern.-Xol. & C. Tapia* N-67 (US); km 1773 carr. [hwy] a Cd. Juárez, 15 Sep 1955, *Hern.-Xol. & V. Mathus* N-1791 (US); Hacienda Sta Gertrudis, criadero [hatchery] número 2 caballería Ejército Nacional [national army cavalry], 21 sep 55, 1650 m, *Hern.-Xol. & V. Mathus* N-1991 (US). 5 mi SW of Chihuahua on rd to Cuauhtémoc, 6 Oct 1959, 1463 m, *Soderstrom* 896 (US); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, J.K. Meents & W.H. Moir 72 (NMC). **Jiménez:** W slope Sierra de Sta Eulalia, 18 Aug 1939, L. H. Harvey 1533 (US); Reserva de la Biosfera Mapimí, 30 Aug 1983, pastizal [pastureland], E. Ruiz de Esparza RRE-51 (RELC); 33 mi SE of Jiménez, 27 Sep 1963, *Reeder & C. Reeder* 3613 (ARIZ); El Hugo, Torreoncitos, 13 Aug 2010, matorral de *Prosopis* sp., 1355 m, D. Ramírez & M.L. Juárez 3394 (CIIDIR). **Julimes:** entre [between] Felipe Ángeles & Trincheras, 31 Jul 1976, pequeño bajío [small shallows] de *Hilaria mutica*, 1240 m, S. González & J.M. Peña 405 (ENCB); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, D. Ramírez & M.L. Juárez 3376 (CIIDIR). **Madera:** Chuichupa, 24 Aug 1937, *LeSueur* 0172 (US); Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, T. Lebgue, G. Quintana & E. Estrada 3783 (NMC). **Meoqui:** Meoqui, 24 Aug 1935, *LeSueur* Mex-032 (US). **Uruachi:** Guazaremos, Río Mayo, 20 Sep 1935, *Gentry* 1841 (US).

*Panicum hirticaule* var. *verrucosum* Zuloaga & Morrone, *Annals Missouri Bot. Gard.* 83: 253–254. 1996.

SPECIMENS EXAMINED. MEXICO. Chihuahua. **Casas Grandes:** W of Casas Grandes, 5 mi S of Hernández, 18 Sep 1960, 2200 m, *Reeder & C. Reeder* 3517 (US); between Casas Grandes and Sabinal, 4–5 Sep 1899, E.W. Nelson 6355 (US), holotype. **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1460 m, L. H. Harvey 1600 (ENCB, US).

290. *Panicum lepidulum* Hitchc. & Chase, *Contr. U.S. Natl. Herb.* 15: 75, f. 64. 1910.

Perennial; solitary or caespitose. Culms 25–70(100) cm tall, erect, with 1 or 2 per plant, sparsely papillose-pilose to scabrous toward the apex. Leaf sheaths papillose-hirsute with ascending hairs; ligules 1.8–2 mm long, membranous; blades 7–20(30) cm long, 5–10 mm wide, flat or conduplicate, sparsely pilose. Panicles 10–20(30) cm long, terminal, largely exserted, ovoid, the branches ascending and flexuous with 1–3 spikelets near the tips, naked below. Spikelets 3.7–4.2 mm long, 1.3–1.5 mm wide, narrowly ovate, turgid, apex acuminate; lower glumes 1.7–2.7 mm long, ovate, 5-veined, the midvein scabrous to the apex, acute or acuminate; upper glumes 3.7–4.2 mm long, apiculate; lower floret sterile, lower lemma similar to the upper glume, lower palea 1.5 mm long; upper floret perfect. Caryopsis 3.2–3.8 mm long, 1.2–1.4 mm wide, oval, turgid and obtuse, pale, glabrous, smooth, bright.

DISTRIBUTION AND HABITAT. *Panicum lepidulum* grows in grasslands, xerophilous scrub, and pine-oak forests. It ranges from Mexico in Chihuahua, Distrito Federal, Durango, Guanajuato, Jalisco, Michoacán, Morelos, and Oaxaca to Central America.

SPECIMENS EXAMINED. MEXICO. Chihuahua. near Chihuahua, Aug 1885, C.G. Pringle 497 (US).

291. *Panicum pampinosum* Hitchc. & Chase, *Contr. U.S. Natl. Herb.* 15: 66, f. 48. 1910.

Caespitose annual. Culms 12–30 cm long, erect, decumbent, glabrous, with branches on central and inferior nodes; nodes hairy, the hairs white and silky about 1 mm long. Leaf sheaths papillose-pilose, collar glabrous; ligules 1 mm long, membranous; blades 3–12 cm long, 3–10 mm wide, flat, linear-lanceolate, with short hairs or hispid, margins pilose toward base, base rounded to subcordate. Terminal panicles 5–6 cm long, axillary panicles 2–3 cm long, contracted, spiciform to subspiciform, generally exserted, few-flowered, often the spikelets clustered near the end of the branches; primary branches 4–8 cm long, appressed and ascending, alternate; pulvinus glabrous; rachis glabrous or scabrous. Spikelets 3.6–4 mm long, 1.4 mm wide, globose, glabrous, acute; lower glumes 2.4–3.1 mm long, 3- to 5-veined, acuminate; upper glumes 3.6–4 mm long, 7-veined; lower lemma sterile, similar to the upper glume, 9-veined; lower paleas 1.2–1.4 mm long, glabrous; upper floret 2–2.4 mm long, 1.2 mm wide, obovate to globose, smooth, lustrous, with 2 basal scars, the scars 0.3 mm long.  $n = 9, 18$ .

DISTRIBUTION AND HABITAT. *Panicum pampinosum* grows in grasslands and open areas; it ranges from the United States to Mexico.



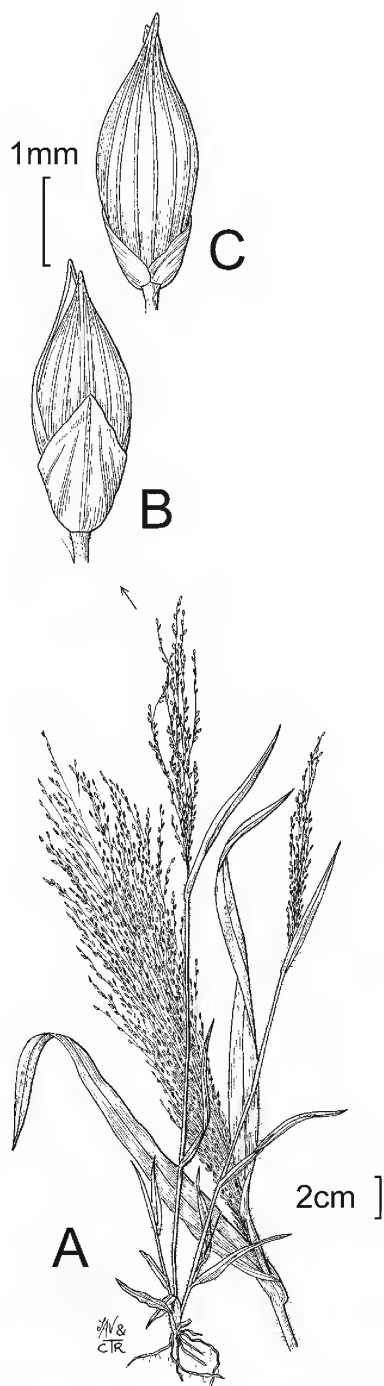


FIGURE 186. *Panicum birticaule* var. *birticaule*. A. Habit. B. Spikelet showing lower glume. C. Spikelet showing upper glume. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Gómez Farías: Laguna de Babicora, San Jose Babicora, 18 Aug 1994, 2200 m, G. Quintana & E. Estrada 3087 (NMC).

292. *Panicum parcum* Hitchc. & Chase, Contr. U.S. Natl. Herb. 15: 68, f. 53. 1910.

Caespitose annual. Culms 30–90 cm tall, erect to geniculate, simple or branched on lower and middle nodes, glabrous. Leaf sheaths papillose-hispid; ligules 0.6–1.5 mm long, membranous, ciliate, the cilia 0.5–1 mm long; blades 10–25 cm long, 3–10 mm wide, linear, flat, papillose-pilose, ciliate, rounded on base. Panicles 7–35 cm long, open, lax, few-flowered, terminal and axillary; primary branches 9–18 cm long, scabrous, spreading; spikelets divergent, solitary at the end of the branches. Spikelets 4.8–5.8 mm long, ovoid, glabrous, acuminate; lower glumes 2.8–4.2 mm long, clasping near base, 5- to 7-veined, acuminate, glumes internode elongated; upper glumes 4.8–5.8 mm long, 9- to 11-veined, acuminate; lower palea 1.5–2.5 mm long; upper floret perfect; upper lemma 2.8–3.4 mm long, 1.5–2 mm wide, smooth, bright, glabrous, obtuse, sessile; anthers 1.4–2 mm long. Caryopsis 2.3–2.5 mm long, whitish.  $2n = 36$ .

DISTRIBUTION AND HABITAT. *Panicum parcum* grows in grasslands, it occurs in Mexico and Central America. This species is reported in Espejo Serna et al. (2000) and Herrera Arrieta and Cortés Ortiz (2010).

293. *Panicum plenum* Hitchc. & Chase, Contr. U.S. Natl. Herb. 15: 80. 1910.

FIGURE 187

Rhizomatous perennial. Culms 70–150 cm tall, decumbent, simple, glaucous; internodes flattened, glabrous. Leaf sheaths glabrous to appressed-pilose; ligules 0.5–1.2 mm long, membranous, ciliate, the cilia 0.2–0.7 mm long; blades 10–30 cm long, 4–8 mm wide, linear, flat, broadened to subcordate near base, glabrous or scaberrulous. Panicles 10–30 cm long, about  $\frac{2}{3}$  as wide, open, all terminal; branches 4–10 cm long, ascending to spreading, solitary. Spikelets 3–3.4 mm long, 1.2–1.4 mm wide, ellipsoid or lanceolate, glaucous, some purplish, solitary, acute to subacute; lower glumes 1–1.2 mm long, less than  $\frac{1}{2}$  as long as the spikelet, subacute, 3-veined; upper glumes 3–3.4 mm long, 5- to 7-veined, obtuse; lower floret sterile or staminate; lower lemma 3–3.4 mm long, 5- to 7-veined, subacute; lower palea shorter than the lower lemma; anthers 2–2.7 mm long; upper floret perfect, rugulose, elliptic, minutely puberulent near the apex, acute; upper lemma 3–3.2 mm long, 1.1–1.3 mm wide; anthers 2.1–2.8 mm long.

DISTRIBUTION AND HABITAT. *Panicum plenum* grows in oak forests and occurs in the United States and Mexico in Chihuahua, Durango, Guerrero, Morelos, Sonora, and Veracruz.

SPECIMENS EXAMINED. MEXICO. Chihuahua. Chihuahua: 14 Oct 1910, Hitchcock 7772 (US); 6 mi N of Chihuahua, 8 Oct 1959, Soderstrom 923 (US). Jiménez: Sta. Eulalia plains, 8 Sep 1885, E. Wilkinson 51, 60 (US).

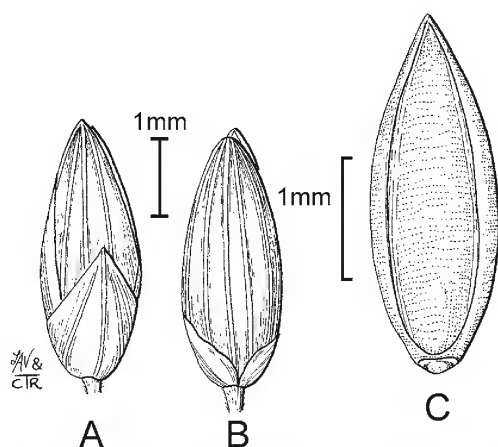


FIGURE 187. *Panicum plenum*. A. Spikelet showing upper below. B. Spikelet showing upper glume above. C. Upper floret, ventral view. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

294. *Panicum trichoides* Sw., Prodr. 24. 1788.

FIGURE 188

Annual. Culms 15–100 cm tall, 0.5–1(2) mm thick, sprawling to erect, without cormlike bases, freely branching and rooting from the lower nodes; nodes prominent, glabrous or pubescent; internodes not succulent, pilose. Sheaths shorter than the internodes, rounded, with papillose-based hairs; collars pilose; ligules 0.2–0.5 mm long; blades 2–7 cm long, 5–20 mm wide, 4–6 times longer than wide, lanceolate, thin, flat, sparsely to densely pilose, the hairs papillose-based; bases asymmetrical, cordate to subcordate; lower margins ciliate, papillose. Panicles 4–24 cm long, almost as wide as long, diffuse, partially included or exserted; primary branches to 10 cm long, ascending to reflexed, branching in the distal  $\frac{2}{3}$ , alternate; pedicels 9–20 mm long, threadlike. Spikelets 1–1.4 mm long, 0.5–0.6 mm wide, not secund, lanceolate to narrowly ovoid, plano-convex in side view, sparsely pubescent; lower glumes 0.4–0.8 mm long,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the spikelets, 1- to 3-veined, subacute; upper glumes 0.8–1.2 mm long, arising 0.2 mm above the lower glumes, 3- to 5-veined; lower florets sterile; lower lemmas 0.1–0.2 mm longer than the upper glumes, 3- to 5-veined; lower paleas 0.5–0.8 mm long, hyaline; upper florets 0.8–1.2 mm long, 0.4–0.6 mm wide, finely rugose; lemmas strongly convex.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Panicum trichoides* grows in moist, often weedy fields, woodlands, and savannahs in Mexico, Central America, and the Caribbean

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: 225 air km SW of Cd. Chihuahua on the Río Batopilas, 5 km downstream from the bridge at La Bufa, 19 Oct 1986,

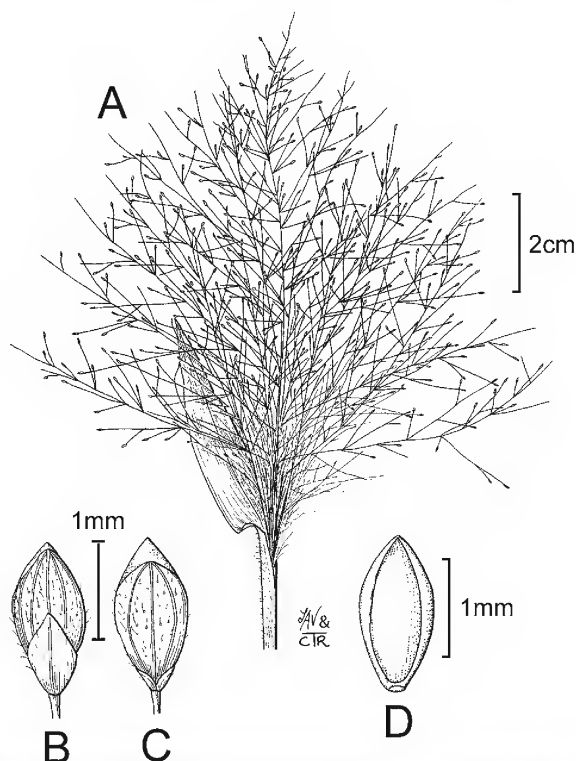


FIGURE 188. *Panicum trichoides*. A. Inflorescence. B. Spikelet showing lower glume below. C. Spikelet showing upper glume below. D. Upper floret, ventral view. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

1160 m, *Spellenberg* 8929 (NMC); 7 km por la brecha [gap] a la Cumbre en dirección a Rodeo, 17 Sep 2003, 1400 m, *Tenorio, J. Rodríguez, M. Hilerio & E. Zárate* 23597, 23629 (US). **Chinipas:** Sagarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela* 22139, 22140 (US); Curahui, 926 m, tropical deciduous forest, 9 Sep 2008, *P.M. Peterson & J.M. Saarela* 22142 (US). **Ocampo:** 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King* 8230 (US).

295. *Panicum vaseyanum* Scribn. ex Beal, Grass. N. Amer. 2: 140. 1896.

Caespitose annual. Culms 30–70 cm tall, ascending or suberect from a decumbent base, rooting at the lower nodes. Leaf sheaths shorter than the internodes, inflated below, glabrous, often exposing the culms with age; ligule 0.5–1.5 mm long, membranous, white, pilose, the hairs 0.4–1.4 mm long; blades 5–20 cm long, 3–7 mm wide, flat, conduplicate on base, glabrous. Panicles 4–7 cm long, narrow, terminal and axillary;

branches 1–4 cm long, 3–5 per rachis, the lower reflexed at maturity, the upper appressed. Spikelets 2.2–3.2 mm long, solitary, appressed, ellipsoid, subacute; lower glumes 0.9–1.2 mm long, almost  $\frac{1}{3}$  as long as the spikelet, obtuse to acute, clasping below; upper glumes slightly shorter than the lower lemma, 7-veined, acute; lower floret sterile; lower lemma 2.2–3.2 mm long; lower palea absent; upper floret perfect; anthers 1.1–1.9 mm long. Caryopsis 2–2.7 mm long, 1–1.2 mm wide, smooth, bright, glabrous, olive-green to brown, acute.

**DISTRIBUTION AND HABITAT.** *Panicum vaseyanum* grows in grasslands and oak forests. It occurs in Mexico in Aguascalientes, Chiapas, Chihuahua, Distrito Federal, Guanajuato, Guerrero, Jalisco, México, Michoacán, and Querétaro.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocono:** Arroyo Rituchi con Rancho & Cueva, 12 Sep 2003, 2205 m, *Bye & col.* 32287 (US). **Casas Grandes:** 5 mi S of Hernández, W of Casas Grandes, 18 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3526 (ARIZ-3527, US). **Chihuahua:** Base of Sierra Madre, 30 Sep 1887, *C.G. Pringle* 1415 (US), holotype; km 15 V. Guerrero-Sto. Tomás, 29 Oct 1954, *Hern.-Xol. & C. Tapia* N-382 (US). **Cuauhtémoc:** 11 mi W of Cuauhtémoc, 4 Sep 1967, low area between hwy and R. R. tracks, surrounded by Oak and Juniper covered hills, 7000 ft, *Reeder, C. Reeder & Gooding* 4849 (ENCB, US). **Guachochi:** 24.6 km S of Mex 127 and 11.1 km NE of La Bufa, 11 Sep 1989, oak forest, 2000 m, *P.M. Peterson, Annable & Y. Herrera* 8054 (ENCB, US). **Guerrero:** Miñaca, 13 Oct 1910, 7000 ft, *Hitchcock* 7757 (US).

296. *Panicum virgatum* L., Sp. Pl. 1: 59. 1753.

*Panicum havardii* Vasey.

FIGURE 189

Rhizomatous perennial; the rhizomes often loosely interwoven, hard, with closely overlapping scales, sometimes short or forming a knotty crown. Culms 40–300 cm tall, 3–5 mm thick, solitary or forming dense clumps, erect or decumbent, usually simple; nodes glabrous; internodes hard, glabrous or glaucous, green or purplish. Sheaths longer than the lower internodes, shorter than internodes above, glabrous or pilose, especially on the throat, margins usually ciliate; ligules 2–6 mm long; blades 10–60 cm long, 2–15 mm wide, flat, erect, ascending or spreading, glabrous or pubescent, adaxial surfaces sometimes densely pubescent, particularly basally, bases rounded to slightly narrowed, margins scabrous. Panicles 10–55 cm long, 4–20 cm wide, exserted, open; primary branches ascending to spreading, scabrous, usually rebranching once, thin, straight, solitary to whorled or fascicled; pedicels 0.5–20 mm long, appressed to spreading. Spikelets 2.5–8 mm long, 1.2–2.5 mm wide, narrowly lanceoloid, turgid to slightly laterally compressed, glabrous, acuminate; lower glumes 1.8–3.2 mm long,  $\frac{1}{2}$ – $\frac{4}{5}$  as long as the spikelets, glabrous, 5- to 9-veined, acuminate; upper glumes and lower lemmas extending 0.4–3 mm beyond the upper florets, 7- to 11-veined, strongly gaping at the apex; lower florets staminate; lower paleas 3–3.5 mm long,



FIGURE 189. *Panicum virgatum*. A. Habit. B. Spikelet showing lower glume below. C. Spikelet showing upper glume. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

ovate-hastate, lateral lobes folded over the anthers before anthesis; upper florets 2.3–3 mm long, 0.8–1.1 mm wide, narrowly ovoid, smooth, glabrous, shiny; upper lemmas clasping the paleas only at the base.  $2n = 18, 21, 25, 30, 32, 35, 36, 54-60, 67-72, 74, 77, 90, 108$ .

**DISTRIBUTION AND HABITAT.** *Panicum virgatum* grows in tall grass prairies on dry slopes and sandy sites in open oak or pine woodlands and along shores, river banks, and brackish marshes. Its range extends from southern Canada throughout the United States to Mexico, Cuba, Bermuda, and Costa Rica; possibly introduced in Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** El Plan RELAC, 26 Mar 83, pastizal [pastureland], 1300 m, *G. Melgoza 130* (RELC). La Campana, 24 Sep 76, Jardín de observación [observation garden], 1500 m, *S. González 763* (RELC). **Juárez:** 38 mi S of Juárez along hwy to Ciudad Chihuahua, 8 Sep 1948, 1300 m, *Gentry 8212* (US); near Paso del Norte, 23 Sep 1886, *C.G. Pringle 1124* (US); Sand Dunes, 10–20 Oct 1935, *LeSueur Mex-082* (US).

## ***Pappophorum* Schreb.**

Perennial; caespitose, essentially glabrous throughout. Culms 30–130 cm tall. Sheaths open; ligules of hairs; micro hairs of the blades with an inflated terminal cell similar in length to the basal cell. Inflorescence terminal, narrow, spike-like or somewhat open panicle; disarticulation above the glumes but not between the florets, these falling together. Spikelets with 3–5 florets, only the lower 1–3 bisexual; glumes subequal, thin, membranous, 1-veined, acute; lemmas rounded on the back, hairy at least basally, obscurely (5)7(9)-veined, veins extending into scaberrulous awns of unequal length, several additional narrow awn-like lobes usually also present, awns and lobes together forming a pappus-like crown; paleas textured like the lemmas, 2-veined, 2-keeled, keels scabrous or hairy; anthers 3; styles 2. Caryopsis elliptical, plump, slightly dorsally flattened or nearly terete; embryos about  $\frac{1}{2}$  as long as the caryopsis.  $x = 10$ .

*Pappophorum* is an American genus with nine species. It grows in warm regions of North and South America.

### KEY TO SPECIES OF *PAPPOPHORUM*

1. Panicles purple-tinged, narrow, but usually with some slightly spreading branches; lemma bodies 3–4 mm long, the awns mostly not more than 1.5 times as long, these rarely spreading at right angles ..... *P. bicolor*
1. Panicles white or tawny, rarely slightly purplish, tightly contracted; lemma bodies 3–3.2 mm long, the awns about twice as long, commonly spreading at right angles when mature ..... *P. vaginatum*

#### **297. *Pappophorum bicolor* E. Fourn., Mexic. Pl. 2: 133. 1886.**

Perennial. Culms 30–80(100) cm tall. Sheaths mostly glabrous, apex with a tuft of hairs on either side; ligules about 1 mm long; blades 10–20(30) cm long, 2–5 mm wide, flat to involute. Panicles 12–20 cm long, narrow but usually with some slightly spreading branches, pink or purple-tinged. Spikelets with the lower 2 or 3 florets bisexual, distal 1 or 2 florets sterile; glumes 3–4 mm long, thin, glabrous, apex acute or minutely notched and mucronate; lemmas somewhat firm, usually faintly 7-veined, with 11–15 awns; lowest lemma bodies 3–4 mm long, midveins and margins pubescent from the base to about midlength, awns about 1.5 times as long as the lemma bodies; paleas subequal to the lemma bodies or slightly longer. Caryopsis about 2 mm long.  $2n = 100$ .

**DISTRIBUTION AND HABITAT.** *Pappophorum bicolor* grows in open valleys, road rights-of-way, and grassy plains in Texas and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, *P.M. Peterson & Annable 5753* (US); km 38 carr. [hwy] Aldama–Ojinaga, 15 Oct 1980, pastizal [pastureland], 1275 m, *Loya 1711* (MEXU); km 60 de la carr. Chihuahua–Ojinaga, 28 Aug 1978, matorral [scrub], 1270 m, *Molinar, Rodríguez & Baray 39* (MEXU). **Camargo:** en llano [flat] entre [between] Los Ángeles & Jaco, 3 Aug 76, matorral, 1265 m, *S. González & J.M. Peña 498* (RELC). **Chihuahua:** Rancho experimental la campana,

82 km al N de la ciudad de Chihuahua, 26 Aug 1978, jardines de observación de zacates [grass observation garden], 1550 m, *C.A. Fernández s.n.* (ENCB). **Jiménez:** El Hugo, Torreoncitos, 13 Aug 2010, matorral de *Prosopis* sp., 1355 m, *D. Ramírez & M.L. Juárez 3396, 3400* (CIIDIR).

#### **298. *Pappophorum vaginatum* Buckley, Prelim. Rep. Surv. Texas App. 1. 1866.**

Perennial. Culms (40)50–100 cm tall. Sheaths mostly glabrous, with a tuft of hairs at the throat; blades 10–25 cm long, 2–5 mm wide, flat to involute, adaxial surfaces scaberrulous. Panicles 10–25 cm long, tightly contracted, usually white or tawny, rarely slightly purple-tinged. Spikelets with 1(2) bisexual florets and 2 reduced florets; glumes (3)4–4.5 mm long, glabrous, acute; lowest lemma bodies 3–3.2 mm long, midveins and margins pubescent from the base to about midlength, awns about twice as long as the lemma bodies, tending to spread at right angles when mature; paleas longer than the lemma bodies.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Pappophorum vaginatum* grows in similar habitats to *P. bicolor*, the two species sometimes growing together. Its range extends from southern Arizona to Texas and northern Mexico and from Uruguay to Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, *P.M. Peterson & Annable 5752* (US); 26 (rd) mi NE of Aldama along Hwy

16 near El Morrion, 15 Sep 1972, 1400 m, *J. Henrickson* 7563 (MEXU, NMC); 60 km Chih–Ojinaga, matorral [scrub], 1270 m, *Molinar, Rodríguez & Baray* 150 (MEXU). **Chihuahua:** Rancho La Campana, 24 Sep 76, Jardines de observación [observation gardens], 1500 m, *S. González* 822 (RELC); Rancho Experimental La Campana, 82 km al N de Chihuahua, 26 Aug 1978, pastizal [pastureland], 1500 m, *M.A. Bernal s/n* (MEXU). **Delicias:** 14 km N of Delicias road from Chihuahua to Delicias, 29 Jun 1974, weedy vegetation in irrigated area, *S.D. Koch* 74156 (ENCB, MEXU). **Jiménez:** 39 mi N of Ceballos on Mex 49, 31 Mar 1971, mesquite along hwy, 3950 ft, *W.E. Harmon* 5431 (ENCB).

### ***Paspalum* L.**

Annual or perennial; caespitose, rhizomatous or stoloniferous. Culms erect, spreading or prostrate, sometimes trailing. Sheaths open; auricles sometimes present; ligules membranous. Inflorescences terminal, sometimes also axillary, panicles of 1 to many spikelike branches, these digitate or racemose on the rachis, spreading to erect, 1 or more branches completely or partially hidden in the sheaths in some species; branch axes

flattened, usually narrowly to broadly winged, usually terminating in a spikelet, sometimes extending beyond the distal spikelet but never forming a distinct bristle; disarticulation below the glumes. Spikelets subsessile to shortly pedicellate, plano-convex, rounded to acuminate, dorsally compressed, not subtended by bristles or a ring-like callus, solitary or paired (1 spikelet of the pair reduced in some species), in 2 rows along 1 side of the branch, with 2 florets, first rachilla segment not swollen, upper glumes and upper lemmas adjacent to the branch axes; lower florets sterile; upper florets sessile or stipitate, bisexual, acute or rounded; lower glumes absent or present only on some spikelets of each branch, without veins or 1-veined, unawned; upper glumes and lower lemmas subequal, membranous, apex rounded, unawned; lower paleas absent or rudimentary; upper lemmas convex, indurate, smooth to slightly rugose, stramineous to dark brown, margins scarious, involute, clasping the paleas; upper paleas indurate, smooth to slightly rugose, stramineous to dark brown. Caryopsis orbicular to elliptical, plano-convex or flattened, white, yellow, or brown.  $x = 10, 12$ .

*Paspalum* includes about 310 species, most of which are native to the Western Hemisphere (Soreng et al., 2017b).

### KEY TO SPECIES OF *PASPALUM*

1. Upper florets dark brown.
  2. Plants perennial; sterile lemma with corrugated or rippled margins; panicle branch rachis 0.5–1 mm wide, not winged ..... *P. plicatulum*
  2. Plants annual; sterile lemma without corrugated or rippled margins; panicle branch rachis 1–2 mm wide, winged .... *P. convexum*
1. Upper florets white-yellowish or straw-colored.
  3. Racemes 2, conjugate or paired at the apex of culms, rarely a third raceme present below the apex; spikelets solitary, rarely paired ..... *P. distichum*
  3. Racemes numerous, generally more than 2, racemose or fasciculate on the axes and not conjugate or paired; spikelets paired.
    4. Spikelets 1.4–2.6 mm long.
      5. Racemes 0.7–2 cm long, 2.2–2.5 mm wide, winged; culms 2–8(15) cm tall; plants annual, caespitose ..... *P. prostratum* var. *pygmaeum*
      5. Racemes 2–12(17) cm long, 0.2–1.2 mm wide, not winged; culms 40–110 cm tall; plants perennial, caespitose or short rhizomatous ..... *P. setaceum*
    4. Spikelets 2.1–3.6 mm long.
      6. Lower glumes absent; plants decumbent, stoloniferous, never rhizomatous; upper glumes 2.8–3.6 mm long, 3-veined ..... *P. pubiflorum*
      6. Lower glumes present at least in the subsessile spikelets; plants erect, caespitose, never stoloniferous; upper glumes 2.2–2.5 mm long, 3- to 5-veined ..... *P. botterii*

299. *Paspalum botterii* (E. Fourn.) Chase, J. Wash. Acad. Sci. 13(20): 436. 1923.

Caespitose perennial. Culms 23–125 cm tall, erect; nodes glabrous or pubescent. Sheaths hirsute with tubercled-based hairs; ligules 0.6–1.9 mm long, an eciliate membrane; blades 17–44 cm long, 12–24 mm wide, flat, pilose, hairy with tubercle-based hairs. Panicles 5–25 cm long, terminal, with 3–7 racemose branches along a central axis, unilateral; racemes 5–20 cm long, erect to divergent, terminating in a spikelet; rachis narrowly winged 0.5–1 mm

wide, glabrous or ciliate on margins. Spikelets 2.2–2.5 mm long, 1.3–1.6 mm wide, paired, obovate, dorsally compressed, obtuse, stramineous to brown, falling entire, densely packed, irregular, 4-rowed; lower glumes 0.4–1.2(1.8) mm long, 1-veined, present in some spikelets (on the subsessile), thinner than fertile lemma; upper glumes 2.0–2.4 mm long, puberulous, 3- to 5-veined, membranous; lemmas 2.1–2.5 mm long, striate, puberulous, 3- to 5-veined, indurate, pallid; paleas involute, indurate. Caryopsis 1.3–1.5 mm long, light to dark brown.  $2n = 40, 60$ .



**DISTRIBUTION AND HABITAT.** *Paspalum botterii* is native to North America and extends from Mexico to Venezuela. It grows at the edges of moist woods and in disturbed areas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** 14.5 km N of Batopilas on road to La Bufa, 12 Sep 1989, 850 m, P.M. Peterson, Annable & Y. Herrera 8065 (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, P.M. Peterson & J.M. Saarela 22145 (US). **Ocampo:** 1 km W of W boundary of Parque Nacional "Cascada de Basaseachi", 21 km from the cahuisori Ocampo road on the road to Candameña, 10.5 km below Cruz Verde, 24 Sep 1994, 965 m, Spellenberg, R. Corral & E. Estrada 12207 (CIIDIR, MEXU, NMC).

300. *Paspalum convexum* Humb. & Bonpl. ex Flügge, Gram. Monogr., *Paspalum* 175. 1810.

FIGURE 190

Annual. Culms 10–53 cm long, erect; nodes glabrous. Sheaths pubescent or glabrous; ligules 2–4.1 mm long; blades 5–25(80) cm long, 2.9–10.2(12) mm wide, flat. Panicles terminal, with 1–5 racemously arranged branches; the branches 1.1–5.4(7) cm long, divergent; branch axes 0.8–1.3 mm wide, not or narrowly winged, glabrous, terminating in a spikelet. Spikelets 2.1–2.6 mm long, 1.7–2.4 mm wide, paired, appressed to the branch axes, broadly obovate to suborbicular, shortly pubescent, light to dark brown; lower glumes absent; upper glumes and lower lemmas short-pubescent, 5- to 7-veined, margins entire, not corrugated; lower paleas rarely present; upper florets dark glossy brown. Caryopsis 1.3–1.5 mm long, white.  $2n = 30, 32, 40, 60$ .

**DISTRIBUTION AND HABITAT.** *Paspalum convexum* grows in disturbed areas in the southeastern United States. It is native in Mexico, Central America, northern South America, and the Caribbean Islands (Zuloaga et al., 2003).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bachiniva:** about 4 mi SE of Bachiniva, 20 Oct 1968, pine and oak woodland, 1800 m, Spellenberg & M. Spellenberg 2000 (ENCB, NMC). **Balleza:** 10 mi SW of El Ojito, 12 Sep 2006, 1902 m, P.M. Peterson 20023, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, P.M. Peterson & J.M. Saarela 22070 (US). **Carichi:** Mojarachic, 5 Sep 1938, I.W. Knobloch 5515 (US). **Chihuahua:** Sierra Madre, 14 Oct 1887, C.G. Pringle 1175 (US); 4 Oct 1888, C.G. Pringle 1875 (US). **Guachochi:** 37.4 km S of Creel on road to Batopilas, 10 Sep 1989, pine forest, 2045 m, P.M. Peterson, Annable & Y. Herrera 8011 (US); Barranca de Basihuare, 28 Aug 2003, bosque de encino [oak forest], 1700 m, P.M. Peterson & P. Catalán 17585 (CIIDIR, US). **Guerrero:** Tomochi, 2 km alrededor del poblado [around the village], 24 Sep 1997, bosque de pino [pine forest], 2100 m, M.A. Vergara 156 (CIIDIR). **Ocampo:** Parque Nacional "Cascada de Basaseachic," a los lados [sides] del arroyo Basaseachic, aprox. a 500 m al N del area de campamentos [camp area], 21 Sep 1990, 1980 m, R. Corral

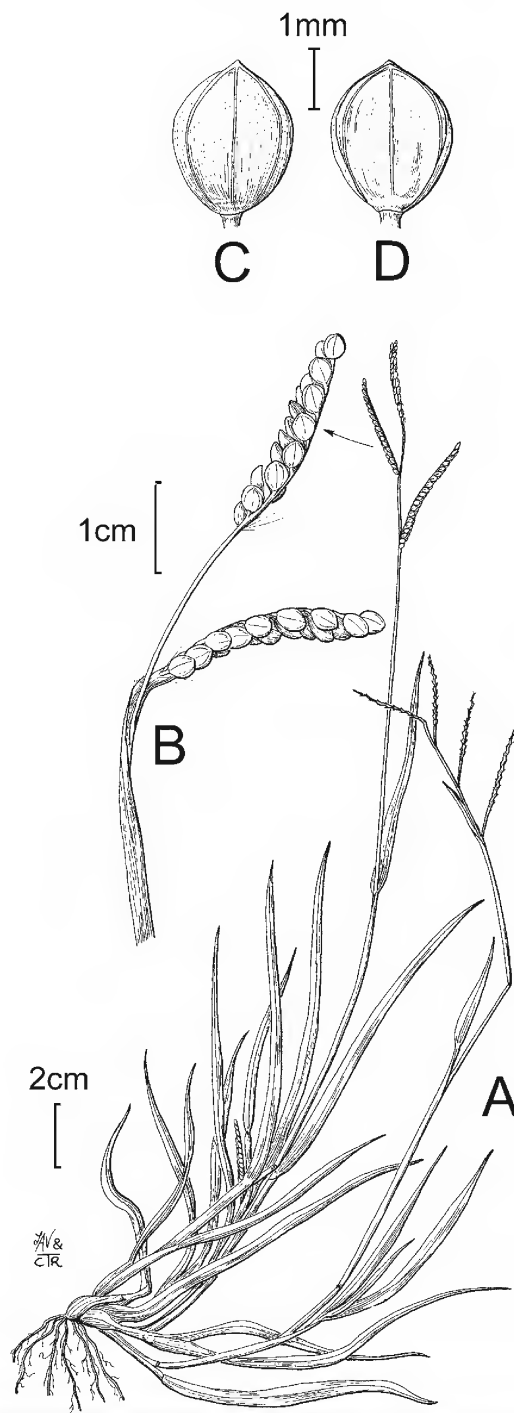


FIGURE 190. *Paspalum convexum*. A. Habit. B. Inflorescence. C. Spikelet, showing upper glume. D. Spikelet showing lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

RCD-3811(NMC); Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8665 (NMC); Parque Nacional Cascada Basaseachic, a los lados del arroyo, 21 Sep 1990, bosque de pino-encino, 1980 m, *R. Corral* RCD3811 (UACJ). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7966 (US). **Temosachi:** Nabogame, 5 Aug 1987, 1800 m, *LaFerr.* 676 (NMC).

301. *Paspalum distichum* L., Syst. Nat. 2: 855. 1759.

*Paspalum paucispicatum* Vasey.

FIGURE 191

Perennial; hardened near the base; rhizomatous sometimes caespitose. Culms 5–65 cm tall, erect; nodes glabrous. Sheaths glabrous, sparsely long-pubescent distally; ligules 1–2 mm long; blades to 14 cm long, 1.8–11.5 mm wide, flat or conduplicate, glabrous or pubescent, apex involute. Panicles terminal, usually composed of a digitate pair of branches, a third branch sometimes present below; branches 1.4–7 cm long, diverging, often arcuate; branch axes 1.2–2.2 mm wide, winged, glabrous, margins scabrous, terminating in a spikelet. Spikelets 2.4–3.2 mm long, 1.1–1.6 mm wide, solitary (rarely paired), appressed to the branch axes, broadly elliptic, stramineous, sometimes partially purple; lower glumes absent or, if present, up to 1 mm long and triangular; upper glumes sparsely and shortly pubescent on the back, 3-veined; lower lemmas glabrous, 3-veined; upper florets stramineous. Caryopsis 1.9–2.1 mm long, yellow.  $2n = 20, 30, 40, 48, 60, 61$ .

**DISTRIBUTION AND HABITAT.** *Paspalum distichum* grows on the edges of lakes, ponds, rice fields, and wet roadside ditches. It is native to warm regions throughout the world, being most abundant in humid areas. In the Western Hemisphere it occurs in the United States and ranges south to Argentina and Chile.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 32 km SW of Villa Ahumada, 22 Oct 1954, *Hern.-Xol.* & *C. Tapia* N-98 (US). **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, *P.M. Peterson & J.M. Saarela* 22072 (US). **Camargo:** 5 km W of cd. Camargo, 5 Aug 1939, 1220 m, *L. H. Harvey* 1407 (ENCB). **Chihuahua:** La Campana, Potrero el plan, 4 km Ote [W] carr [hwy] panamericana, 6 sep 1973, lugares humedos [humid places], 1500 m, *Valdés-Reyna* VR-118 (CIIDIR, ENCB); VR-181 (RELC). **Cuahtémoc:** km 5 to the W of Cd. Cuahtémoc, 27 Oct 1954, *Hern.-Xol.* & *C. Tapia* N-348 (US); about 13 mi SE of Bachimba along hwy 7, along roadside, 11 Jul 1950, Alkali soil, *Reeder, C. Reeder & Goodding* 1252 (ENCB). **Delicias:** km 76 Cd. Chihuahua–Cd. Delicias, 1 Nov 1954, 950 m, *Hern.-Xol.* & *C. Tapia* N-531 (US). **Guachochi:** small spring below Napuchis, 2 Sep 2003, 1950 m, *P.M. Peterson & P. Catalán* 17658 (US). **Guerrero:** Miñaca, 13 Oct 1910, *Hitchcock* 7735, 7762 (US). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep

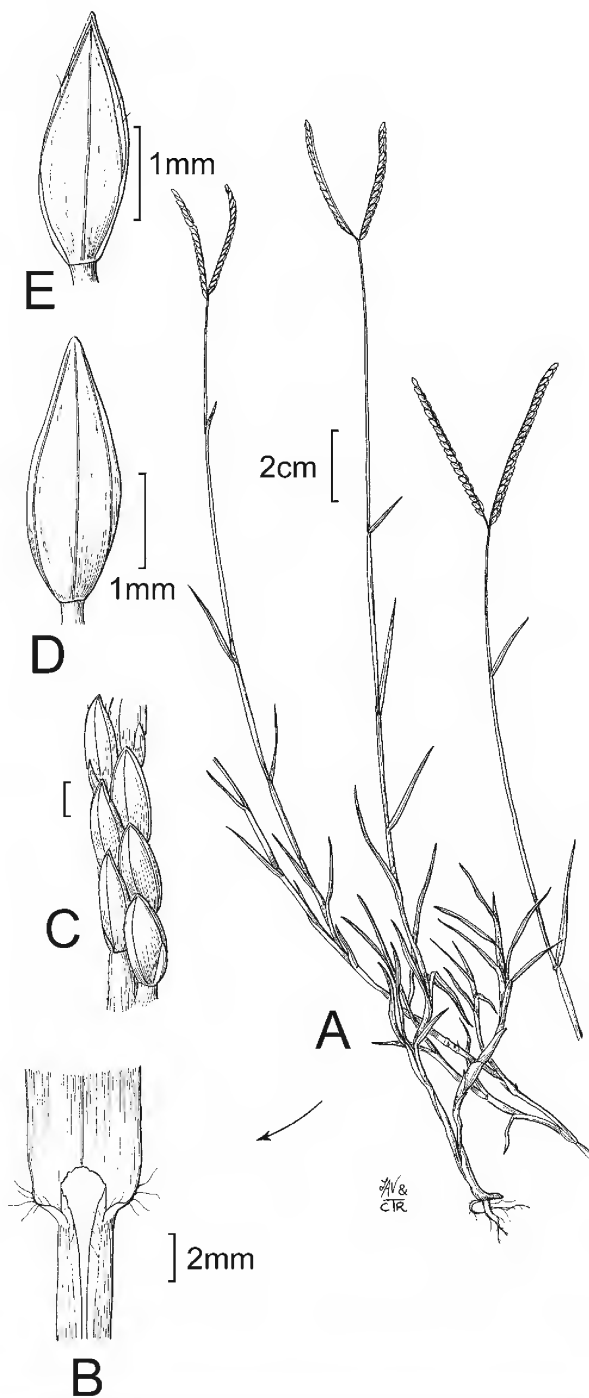


FIGURE 191. *Paspalum distichum*. A. Habit. B. Ligule. C. Portion of the inflorescence branch. D. Spikelet showing upper glume. E. Spikelet showing lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

1994, 2300 m, *Quintana, Lebgue & Estrada 3770* (NMC). **Matamoros:** about 12 mi S of Villa Matamoros, 8 Oct 1966, *Reeder & C. Reeder 4624* (ARIZ, ENCB, US). **Riva Palacio:** Nuevo Majalca, approx. 14.5 km W of hwy 45, N of Chihuahua, 22 Sep 1988, grassland, 1700 m, *P.M. Peterson & Annable 5773* (US). **Saucillo:** along Isla de Perla road about 4 mi E of Cd. Delicias, 11 Jul 1950, in cultivated and irrigated valley, *Reeder, C. Reeder & Goodding 1260* (ENCB).

302. *Paspalum plicatulum* Michx., Fl. Bor.-Amer. 1: 45. 1803.

FIGURE 192

Caespitose perennial; rhizomes short, often indistinct. Culms 30–120 cm tall, erect, or geniculate ascending. Ligules 2–3 mm long, an eciliate membrane; blades 15–30 cm long, 2–7 mm wide, flat or folded, surface glabrous or pilose, apex acuminate. Inflorescence composed of 2–7 racemes, the racemes 2–15 cm long, borne along a central axis, unilateral, the central axis 3–15 cm long; rachis 0.5–1 mm wide, wingless, angular. Spikelets 2.3–3.2 mm long, 1.5–2.2 mm wide, in pairs, with 1 basal sterile floret; 1 fertile floret, 2- to 4-rowed; fertile spikelets pedicelled, without rhachilla extension, elliptic or obovate, dorsally compressed, plano-convex, obtuse, falling entire; lower glume absent; upper glume reaching apex of floret, thinner than fertile lemma, ovate, membranous, without keels, 5-veined, surface glabrous or puberulous; lemma of lower sterile floret similar to upper glume, ovate, as long as the spikelet, membranous, corrugated or rippled near margins, 5-veined, obtuse; fertile lemma 2–3 mm long, ovate, gibbous, indurate, dark brown, surface granulate, margins involute; palea involute, indurate.  $2n = 10, 20$ .

**DISTRIBUTION AND HABITAT.** *Paspalum plicatulum* grows on the edges of forests and disturbed areas. It is native to the Americas: south central and southeastern United States to Mexico, South America, and the Caribbean Islands. It has been reported from Chihuahua (Herrera Arrieta 2001).

303. *Paspalum prostratum* var. *pygmaeum* Scribn. & Merr., Bull. Div. Agrostol., U.S.D.A. 24: 9. 1901.

Caespitose annual. Culms 2–8(15) cm tall, erect to geniculate near base. Sheaths with scattered papillose-based hairs, these often appressed; ligules 0.4–0.6 mm long, a ciliate membrane; blades 1.5–7.5 cm long, 2–7 mm wide, lanceolate, flat, pilose, the hairs papillose-based. Panicles terminal with 1–4 racemes; the racemes 0.7–2 cm long, 2.2–2.5 mm wide, winged, exserted or partially enclosed in the sheath, reflexed and spreading at 80°–100° from the culm axis; rachis nodes hairy. Spikelets 2–2.2 mm long, glabrous, light yellowish, solitary in 2 rows; lower glume absent; upper glumes 2 mm long, elliptic, hyaline, 3-veined; lemmas 2 mm long, elliptic, 3-veined, chartaceous, shiny.

**DISTRIBUTION AND HABITAT.** *Paspalum prostratum* var. *pygmaeum* can be found growing on rocky slopes with *Pinus*, *juniperus*, and *Holodiscus* in wet clayish soils between

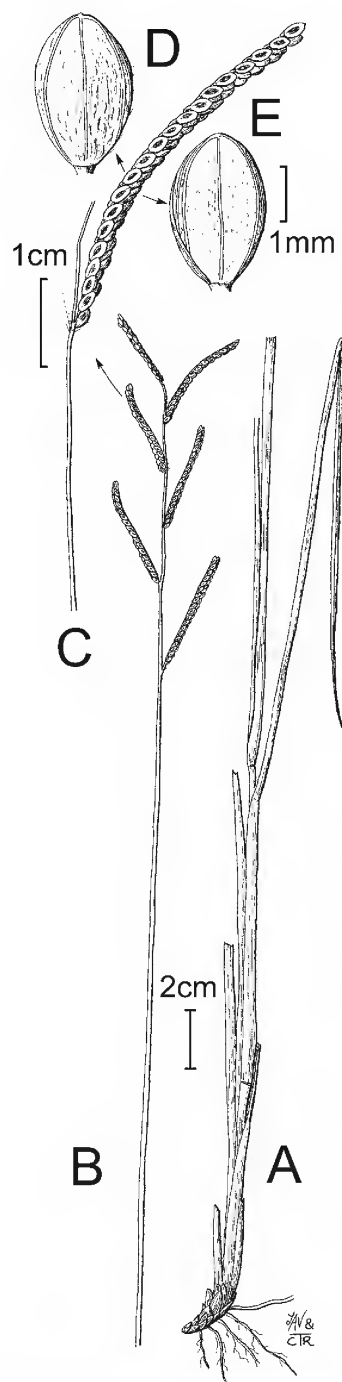


FIGURE 192. *Paspalum plicatulum*. A. Habit. B. Culm and Inflorescence. C. Inflorescence branch. D. Spikelet showing upper glume. E. Spikelet showing lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

1,700 and 3,300 m. It is known from the states of Durango, Jalisco, México, Distrito Federal, Michoacán, Morelos, and Veracruz (Herrera Arrieta, 2001; Dávila et al., 2006). *Paspalum prostratum* var. *pygmaeum* can be separated from *Paspalum prostratum* Scribn. & Merr. var. *prostratum* in having undifferentiated leaf blade bases (rounded in the latter variety), narrower leaf blades (2–7 versus 8–20 mm wide), and shorter culms (2–8[15] versus 30–75 cm tall) (Clayton et al., 2006).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** near Cumbres Mohinora, 13 Sep 2006, 3250–3300 m, P.M. Peterson 20035, F. Sánchez Alvarado, E.P. Gómez Ruíz (CIIDIR, US).

304. *Paspalum pubiflorum* Rupr. ex E. Fourn., Mexic. Pl. 2: 11. 1886.

FIGURE 193

Perennial; usually decumbent, rooting at the nodes, stoloniferous. Culms 30–130 cm long, decumbent; nodes glabrous or pubescent. Sheaths glabrous or pubescent; ligules 1–3.2 mm long; blades to 31 cm long, 4–18 mm wide, flat, glabrous, with a few hairs behind the ligules. Panicles terminal, with 2–7 racemously arranged branches; branches 2.2–7.9 cm long, divergent to spreading, terminating in a spikelet; branch axes 1.1–2.3 mm wide, narrowly winged, glabrous, margins scabrous. Spikelets 2.8–3.6 mm long, 1.5–2 mm wide, paired, imbricate, appressed to divergent from the branch axes, elliptic to obovate, pubescent or glabrous, light brown to stramineous; lower glumes absent; upper glumes and lower lemmas 2.8–3.6 mm long, glabrous or sparsely pubescent, the hairs shorter than 0.1 mm long, 3-veined, margins entire; lower lemmas lacking ribs over the veins; upper florets stramineous. Caryopsis 1.8–2 mm long, golden brown or white.  $2n = 60$ , ca. 64.

**DISTRIBUTION AND HABITAT.** *Paspalum pubiflorum* grows on the edges of forests and in disturbed areas. It is native to the southeastern United States, Mexico, and Cuba.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** km 38 Cd. Chihuahua Hormigas, N of V. Aldama, 31 Oct 1954, 1100 m, *Hern. Xol. & C. Tapia N-517* (US). **Camargo:** 5 km W of Cd. Camargo, 5 Aug 1939, 1220 m, *L. H. Harvey 1405a* (ENCB); 10 mi N of cd. Camargo, 4 Oct 1953, scattered plants along the ditch, 1280 m, *Reeder & C. Reeder 2611* (ENCB). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, P.M. Peterson & J.M. Saarela 22156 (US). **Chihuahua:** near Chihuahua, Sep 1885, C.G. Pringle 374 (US); 12 mi N of Chihuahua on rd to Cd. Juárez, 8 Oct 1959, 1494 m, *Soderstrom 932* (US). **Madera:** Paraje Agua Caliente, predio particular [private property] El Chorruto, 17 Oct 1990, bosque de encino [oak forest], 2350 m, O. Bravo 1946 (CIIDIR); Paraje Sirupa, ejido Cebadilla de Dolores, 24 Aug 1990, vegetación riparia [riparian vegetation], 1220 m, O. Bravo 1254 (CIIDIR). **Saucillo:** along Isla de Perla road about 4 mi E of cd. Delicias, 11 Jul 1950, in cultivated and irrigated valley, 1250 m, *Reeder & C. Reeder 1253* (ENCB).

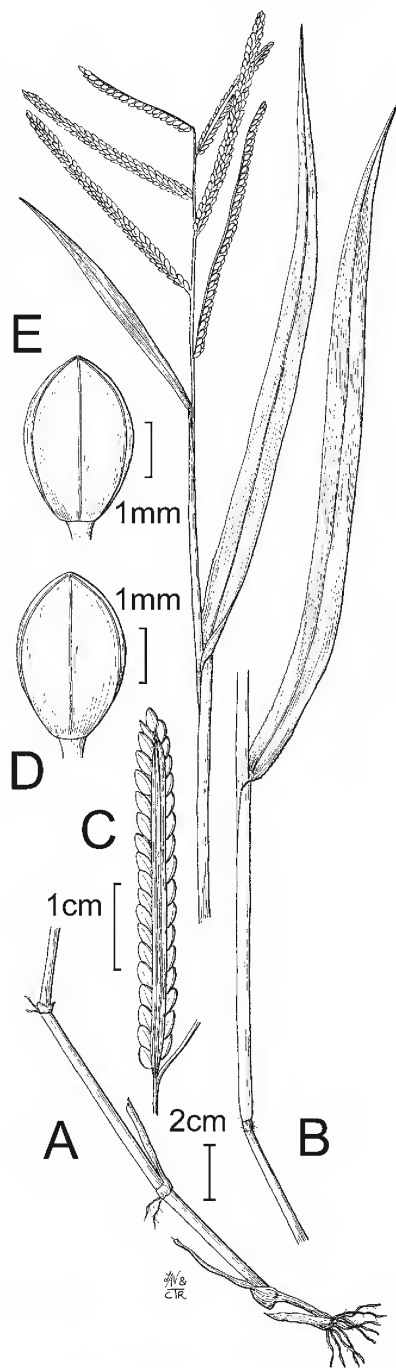


FIGURE 193. *Paspalum pubiflorum*. A. Culm base. B. Culm and inflorescence. C. Inflorescence branch. D. Spikelet showing upper glume. E. Spikelet showing lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

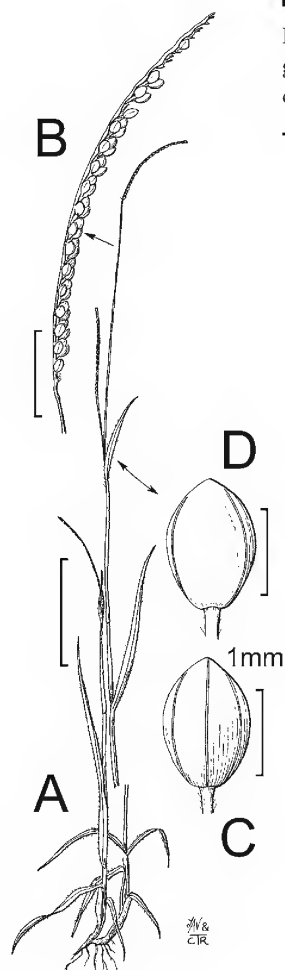


FIGURE 194. *Paspalum setaceum*. A. Habit. B. Inflorescence. C. Spikelet showing upper glume. D. Spikelet showing lower lemma. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

305. *Paspalum setaceum* Michx., Fl. Bor.-Amer. 1: 43. 1803.

FIGURE 194

Perennial; caespitose or short rhizomatous. Culms 40–110 cm tall, erect, spreading, or prostrate; nodes glabrous or pubescent. Sheaths glabrous or pubescent; ligules 0.2–0.5 mm long; blades flat, glabrous or pubescent. Panicles terminal and axillary, with 1–6 racemously arranged branches, axillary panicles partially or completely enclosed by the subtending leaf sheath; branches 2–12(17) cm long, ascending to spreading, often arcuate, terminating in a spikelet; branch axes 0.2–1.2 mm wide, glabrous, sometimes scabrous. Spikelets 1.4–2.6 mm long, paired, imbricate, appressed to the branch axes, elliptic to obovate to ovate to orbicular, stramineous or brown; lower glumes absent; upper glumes and lower lemmas glabrous or with short capitate-pubescent (glandular tipped), 3-veined, margins entire; lower lemmas lacking ribs over the veins; upper florets stramineous. Caryopsis elliptic to suborbicular, white.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Paspalum setaceum* is a variable species that grows east of the Rocky Mountains in the contiguous United States and Mexico. *Paspalum setaceum* has nine varieties in North America; *P. setaceum* var. *ciliatifolium* and *P. setaceum* var. *setaceum* are known from Mexico, and both occur in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua**, 10–20 Oct 1935, *LeSueur Mex-062* (US); 1 km al E del Rancho El 45, 28 Sep 73, 1450 m, *J. Valdés-Reyna VR-369* (RELC). **Juárez**: near Paso del Norte, 23 Sep 1886, *C.G. Pringle 1123* (US).

#### KEY TO VARIETIES OF *PASPALUM SETACEUM*

1. Lower lemmas with evident midveins; leaf blades dark green to purplish, glabrous or with a few hairs along the midrib (rarely short pilose) ..... *P. setaceum* var. *ciliatifolium* (Michx.) Vasey
1. Lower lemmas without evident midveins; leaf blades grayish-green, conspicuously hirsute, usually with long stiff hairs and short soft hairs ..... *P. setaceum* var. *setaceum*

#### ***Peyritschia* E. Fourn.**

Perennial; caespitose. Culms erect or decumbent, slender or weak. Ligules an eciliate membrane; blades flat or involute. Inflorescence a panicle, open or contracted, sometimes spiciform. Spikelets solitary, comprising 2 fertile florets, without rachilla extension or with a barren rachilla extension, sometimes with reduced florets at the apex; spikelets oblong or cuneate, disarticulating below each floret. Glumes linear, lanceolate or elliptic, persistent, hyaline or membranous, shorter than spikelets, same size or exceeding the apex of the floret, lower glumes 1-veined,

upper glumes 1- to 3-veined, as long as fertile lemma; fertile lemmas lanceolate, elliptic or oblong, subterete, membranous or cartilaginous, 5-veined, lemma surface smooth or scabrous, the margins flat or involute, the apex entire, toothed or 2- to 4-lobed, 1-awned, dorsally emerging, straight or geniculate; palea embraced by lemma or gaping, same size or a little less than the lemma, hyaline or membranous; apical sterile florets resembling fertile but underdeveloped. Caryopsis with adherent pericarp, fusiform, soft; endosperm liquid.  $x = 7$ .

*Peyritschia* is a genus with seven species native to temperate regions of the New World (Finot et al., 2004, 2006).



KEY TO SPECIES OF *PEYRITSCHIA*

1. Lemma awn emerging 1 mm above the base; rachilla hairs short, inconspicuous; panicle densely cylindrical, the axis hidden by the spikelets ..... *P. pringlei*  
 1. Lemma awn emerging 2–3 mm above the base; rachilla hairs 1.5–2.5 mm long in the superior part of each internode; panicles lax, the axis at least partially visible ..... *P. deyeuxioides*

306. *Peyritschia deyeuxioides* (Kunth) Finot, Contr. U.S. Natl. Herb. 48: 478. 2003. *Avena deyeuxioides* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 147. 1816. *Trisetum deyeuxioides* (Kunth) Kunth, Révis. Gramin. 1: 102. 1829.

Caespitose perennial. Culms 50–120 cm tall, slender, erect or ascending, glabrous, simple, sometimes branched on the lower nodes. Sheaths glabrous, scabrous or pilose; ligules (0.5)1–4 mm long; blades 8–25 cm long, (1.5)2–6 mm wide, flat, glabrous or pilose. Panicles 10–35 cm long, 1–4 cm wide, narrow, lax, somewhat open and nodding, axis visible at least partially, scabrous, often pilose; branches 6–11 cm long, appressed or ascending, fasciculate, the longest naked on the lower  $\frac{1}{3}$ – $\frac{1}{2}$ . Spikelets 4.5–6(8) mm long, 2- or 3-flowered, disarticulation above glumes and between florets; rachilla hairy, the hairs 1.5–2.5 mm long near the summit of each internode; internodes 1–1.7 mm long; glumes 3.5–5.5(8) mm long, subequal, 1-veined, scabrous on the back; lemma of fertile florets 3.5–4.5(6) mm long, subcylindrical, glabrous, the margins involute, apex 2-lobed, the lobes rounded, truncate or acute, awned, the awns 5–9(12) mm long, emerging 2–3 mm above the base of the lemma, geniculate and flexuous or twisted below, scabrous and pilose, the hairs 2.5–3 mm long; stamens 2, the anthers 1–1.5(2.5) mm long. Caryopsis 1.8–2.5 mm long.  $2n = 14, 28$ .

**DISTRIBUTION AND HABITAT.** *Peyritschia deyeuxioides* grows in moist meadows and grasslands, thorny scrub, and oak–pine forests. It is native in Mexico, Central America, and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** Camino Balleza–Guachochic, km 45, 24 Sep 1981, pastizal [pastureland], R. Fierros & M.A. Siqueiros 1590 (MEXU); 36 km al SE de Baquiriachi, camino [road] Balleza, 24 Sep 1985, bosque de pino–encino [pine–oak forest], 2225 m, P. Dávila, Tenorio & I. Solís 133 (MEXU). **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino, 1891 m, P.M. Peterson & P. Catalán 17549 (US); SW Chihuahua, Aug 1885, E. Palmer 14 (US). **Boconyna:** Sánchez, 12 Oct 1910, Hitchcock 7676 (US); 3.7 km N of San Juanito on road to Creel, near km 53 marker, 24 Sep 1988, pine woods, 2200 m, P.M. Peterson & Annable 5861 (ENCB, US); Cabecera de la cabaña de Recognata, 22 Sep 1997, bosque de pino–encino en cañada, 2400 m, B. Tah V. 30 (MEXU). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, P.M. Peterson & J.M. Saarela 22111 (US). **Chihuahua:** Mapula Mts, 30 Oct 1886, C.G. Pringle 821 (US); Base of the Sierra Madre, 21 Sep 1887, pine plains, C.G. Pringle 1428 (MEXU, US); Canyons of the Sierra Madre, 13 Sep 1887, springy banks, C.G. Pringle 1432 (MEXU, US). **Cuisihuiriachic:** Rancho

El Coronel, 2 Sep 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], 2500 m, Loya & Méndez 1521 (MEXU). **Guachochi:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, P.M. Peterson & J.M. Saarela 22058 (US); approx. 22.5 mi NE of Cieneguita de Barranca on road towards Creel, 5 Sep 2003, bosque de pino, 2160 m, P.M. Peterson & P. Catalán 17695 (US); proximidad a la Col. Chuichupa, 1 Nov 1990, pastizal & bosque [grove] de *Juniperus deppeana*, 2240 m, A. Benítez 2182 (CIIDIR, MEXU); Ciénega Ojo de la Vibora, ejido El Largo, 14 Oct 1990, bosque de pino, 2300 m, O. Bravo 1903 (MEXU, CIIDIR). **Guerrero:** km 193 carr. [hwy] Chihuahua–Hermosillo, tramo [section] San Pedro–Temochic, 24 Sep 1997, 2200 m, M.A. Vergara 174 (MEXU); carr. la Junta–San Juanito, 17 km, 22 Sep 1997, 2290 m, B. Tah V. 1 (MEXU). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, T. Lebgue, G. Quintana & E. Estrada 3765 (NMC); Laguna de Babicora, Arroyo Las Varas, 10 Sep 1994, 2300 m, G. Quintana & E. Estrada 3559 (NMC); 10 km al sureste [southeast] de Madera, 5 Oct 74, bosque de pino–encino, 2000 m, Valdés-Reyna VR-665 (RELC); Chuhuichupa, Aug–Sep 1936, LeSueur Mex-0114 (MEXU); Madera, 8 Sep 1977, 2400 m, Blanco 10/77 (MEXU). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” in a canyon along Rio Basaseachi leading to falls, 4 Oct 1986, 1950 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8805 (NMC). **Namiquipa:** Aprox. km 39 carr. Chihuahua–Namiquipa, 24 Sep 1997, bosque de encino, 2300 m, M.A. Vergara 180-A (MEXU). **Tomochi:** Tomochi, 2 km alrededor del poblado [near the village], 24 Sep 1997, bosque de pino, 2100 m, M.A. Vergara 145 (MEXU).

307. *Peyritschia pringlei* (Scribn.) S. D. Koch, Taxon 28(13): 233. 1979. *Deschampsia pringlei* Scribn., Proc. Acad. Nat. Sci. Philadelphia 43(2): 300–301, t. 13, f. 1, 1a. 1891.

Caespitose perennial. Culms 30–100 cm tall, glabrous, simple. Sheaths glabrous, sometimes pubescent below; ligules 1.5–4 mm long, membranous, truncate or rounded; blades 5–15 cm long, 1–3(4) mm wide, flat, occasionally involute, glabrous to pilose. Panicles 7–15(20) cm long, 0.5–1.5 cm wide, compact, narrow to somewhat open and interrupted below, axis hidden between the spikelets, scabrous; rachilla hairy, the hairs inconspicuous; branches ascending and appressed. Spikelets (3.5)4–5 mm long, 2- or 3-flowered, disarticulation above glumes and between florets; rachilla sparsely pilose, the hairs 0.7–1 mm long; glumes 4.1–5.3 mm long, equal to subequal, 1-veined; lemma of lower floret 3–4.3 mm long, the upper shorter, apex 2-lobed, the lobes rounded, awns (4.5)5–7 mm

long, emerging 1 mm above the base of the lemma, geniculate and twisted near the base; stamens 2, anthers 0.8–1 mm long. Caryopsis 1.5–2 mm long.  $2n=28$ .

**DISTRIBUTION AND HABITAT.** *Peyritschia pringlei* grows in grasslands and oak–pine forests. It is native in Mexico, Central America, and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** 1.1 km N of San Juanito near large lumber mill, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5865 (ENCB, US). **Chihuahua:** Chihuahua, 9 Oct 1887, C.G. Pringle 1429 (US), holotype. **Cuauhtémoc:** 20.9 km W of Cuauhtémoc on hwy 16, 23 Sep 1988, pine woods, 2000 m, P.M. Peterson & Annable 5821 (ENCB, US). **Guadalupe y Calvo:** 9.5 mi E of Guadalupe y Calvo on hwy 24, 14 Sep 2006, 2570 m, P.M. Peterson 20056, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guerro:** 35.4 km SW of La Junta and approx. 74 km N of Creel, 24 Sep 1988, pine woods, 2200 m, P.M. Peterson & Annable 5830 (ENCB, US); 37 km SW of La Junta on road to Creel at the puente [bridge] Arroyo Ancho, 10 Sep 1989, pine forest, 2230 m, P.M. Peterson, Annable & Y. Herrera 7994 (ENCB, US); entre La Junta & Namiquipa: Aprox. km 39 carr. [hwy] Chihuahua–Namiquipa, 24 Sep 1997, bosque de encino [oak forest], 2300 m, M.A. Vergara 180 (MEXU); Miñaca, 13 Oct 1910, 7000 ft, Hitchcock 7762 (MEXU); Carr. la Junta–San Juanito, 17 km, 22 Sep 1997, 2290 m, B. Tab V. 13 (MEXU). **Gómez Fariás:** near Gomez Fariás, between Cuahutémoc and Buenaventura, 26 Oct 1881, A.A. Beetle M-7939 (MEXU). **Temochic:** Temochi, 13 Aug 1976, bosque de pino–encino [pine–oak forest], 2195 m, S. González & J.M. Peña 606 (RELC).

### ***Phalaris* L.**

Annual or perennial; caespitose or not, sometimes rhizomatous. Culms sometimes swollen at the base, not branching above

the base. Leaves more or less evenly distributed, glabrous; sheaths open for most of their length, uppermost sheaths often somewhat inflated; auricles absent; ligules hyaline, truncate to acuminate, entire or lacerate, glabrous; blades usually flat, sometimes revolute. Inflorescence a terminal panicle, sometimes spike-like, ovoid to cylindrical, dense, sometimes interrupted, with 10–200 spikelets borne singly or in clusters, the spikelets homogamous in species with single spikelets, heterogamous in species with the spikelets in clusters, the lower spikelets in the clusters staminate (rarely sterile), the terminal spikelets bisexual or pistillate. Spikelets pedicellate, homomorphic, laterally compressed, 1- to 3(4)-flowered, only the terminal (or only) floret reproductively functional, the lower floret(s), if present, sterile; disarticulation in species with single spikelets above the glumes, the florets falling together or, in species with clustered spikelets, usually at the base of the spikelet clusters, sometimes beneath the bisexual or pistillate spikelets; glumes equal or almost so, exceeding the florets, 1- to 5-veined, keeled, keels often conspicuously winged; lower (sterile) florets reduced, varying from knoblike projections on the calluses of the terminal florets to linear or lanceolate lemmas less than  $\frac{3}{4}$  as long as the terminal florets; terminal florets usually bisexual, pistillate, or staminate, rarely sterile, in the lower spikelets of a spikelet cluster; lemmas of terminal florets coriaceous to indurate, shiny, glabrous or pubescent, inconspicuously 5-veined, acute to acuminate or beaked, unawned; paleas similar to the lemmas in length and texture, enclosed by the lemmas at maturity, 1-veined, mostly glabrous, veins shortly hairy; lodicules absent or 2 and reduced; anthers 3; ovaries glabrous; styles 2, plumose. Caryopsis with a reticulate pericarp, falling free of the lemma and palea; hila long-linear.  $x = 6, 7$ .

*Phalaris* has 17 species, most of which grow in temperate regions (Baldini, 1995; Clayton et al., 2006). It is found in a wide range of habitats, although most species prefer somewhat mesic, disturbed sites.

### KEY TO SPECIES OF *PHALARIS*

1. Spikelets in clusters, heterogamous, the lower 4–7 spikelets in each cluster with a staminate (rarely sterile) terminal floret, only the terminal spikelet in the clusters with a pistillate or bisexual floret; disarticulation usually at the base of the spikelet clusters, sometimes beneath the bisexual or pistillate spikelets ..... *P. paradoxa*
1. Spikelets borne singly, homogamous, all spikelets with a bisexual floret; disarticulation above the glumes, below the sterile florets.
  2. Glume keels not winged or with wings no more than 0.2 mm wide.
    3. Perennial; bisexual florets with acute to somewhat acuminate apex ..... *P. arundinacea*
    3. Annual; bisexual florets with beaked or strongly acuminate apex ..... *P. caroliniana*
  2. Glume keels broadly winged, the wings 0.2–1 mm wide.
    4. Sterile florets usually 1, or if 2, then the lower floret up to 0.7 mm long and the upper floret 1–3 mm long ..... *P. aquatica*
    4. Sterile florets 2, equal to subequal, 0.5–4.5 mm long.
      5. Panicles cylindrical, discontinuous, sometimes lobed ..... *P. angusta*
      5. Panicles usually ovoid to ellipsoid, occasionally cylindrical, continuous, not lobed.
        6. Glumes 0.8–1.5 mm wide, with acute to acuminate apices ..... *P. caroliniana*
        6. Glumes 2–2.5 mm wide, with rounded, mucronate apices ..... *P. canariensis*

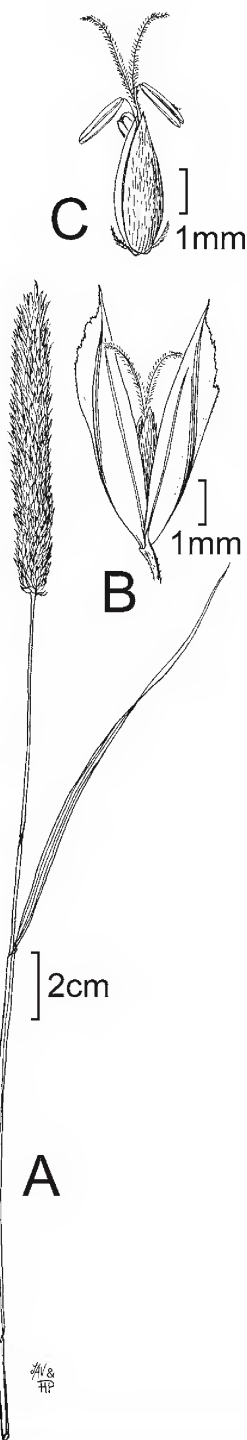


FIGURE 195. *Phalaris angusta*. A. Culm and inflorescence. B. Spikelet. C. Florets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

308. *Phalaris angusta* Nees ex Trin., Sp. Gram. 1: t. 78. 1827.

FIGURE 195

Annual; not rhizomatous. Culms 10–170 cm tall. Ligules 4–7 mm long, truncate to rounded or obtuse, lacerate; blades 3–15 cm long, 2–12 mm wide. Panicles 2–20 cm long, 0.6–1.5 cm wide, cylindrical, discontinuous, sometimes lobed; branches sometimes evident, the spikelets borne singly, not clustered. Spikelets homogamous, all spikelets with a bisexual floret; florets 3; disarticulation above the glumes, beneath the sterile florets; glumes 2–5.5 mm long, 0.6–1.1 mm wide, rectangular, often purplish, keels winged, scabrous, wings about 0.4 mm wide, smooth, lateral veins conspicuous, scabrous, apex mucronate; sterile florets 2, 0.5–1.5 mm long, equal, linear, sparsely and inconspicuously hairy; bisexual florets 2–3.8 mm long, 0.9–1.5 mm wide, laterally compressed, pubescent, particularly distally, shiny, apex tapering; anthers 0.5–1.3 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Phalaris angusta* grows in the contiguous United States and Mexico and in South America from Ecuador south to Chile and Argentina. This species occurs in open grasslands and prairies. Reported from Chihuahua by Espejo Serna et al. (2000).

309. *Phalaris aquatica*\* L., Cent. Pl. I. 4. 1755.

FIGURE 196

Caespitose perennial; short rhizomatous. Culms 60–200 cm tall, often swollen at the base, rooting at the lower nodes. Ligules 2–12 mm long, truncate, lacerate; blades 5–15(20) cm long, 0.5–10 mm wide. Panicles 1.5–15 cm long, 1–2.5 cm wide, usually cylindric, sometimes ovoid, occasionally lobed at the base, the spikelets borne individually, not clustered; branches not evident. Spikelets homogamous, all spikelets with a bisexual floret; florets 2–3(4), occasionally with 2 bisexual florets, occasionally the terminal floret viviparous; disarticulation above the glumes, beneath the sterile florets; glumes 4.4–7.5 mm long, 1.2–1.5 mm wide, keels winged distally, wings 0.2–0.4 mm wide, usually entire, lateral veins conspicuous, smooth; sterile florets usually 1, if 2, the lowest floret much shorter, to 0.7 mm long, the upper or only sterile floret 1–3 mm long, pubescent; bisexual florets 3.1–4.6 mm long, 1.2–1.5 mm wide, pubescent, stramineous, acute; anthers 3–3.6 mm long.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Phalaris aquatica* is native to the Mediterranean region and was introduced into South America because of its forage value. It is also reported as introduced to Chihuahua, Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Chihuahua: Rancho La Campana, 4 km al E de la carr. Panamericana, 17 May 1975, jardín de adaptación de zacates [grass adaptation garden], 1500 m, J. Valdés-Reyna VR-903 (RELIC).

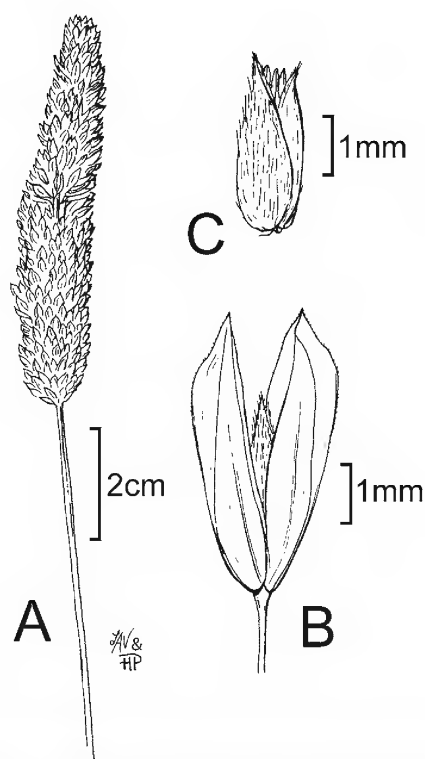


FIGURE 196. *Phalaris aquatica*. A. Inflorescence. B. Spikelet. C. Florets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

310. *Phalaris arundinacea* L., Sp. Pl. 1: 55. 1753.

FIGURE 197

Perennial; not caespitose, rhizomatous, rhizomes scaly. Culms 40–250 cm tall. Ligules 4–10(11) mm long, truncate, lacerate; blades 10–30 cm long, 5–20 mm wide, surfaces scabrous, margins serrate. Panicles 5–40 cm long, 1–2 cm wide, elongate, often dense, always evidently branched at least near the base; branches to 9 cm long, normally appressed but spreading during anthesis, the spikelets borne singly, not clustered. Spikelets homogamous, all spikelets with a bisexual floret; florets 3; disarticulation above the glumes and beneath the sterile florets; glumes 4–8.1 mm long, 0.8–1 mm wide, subequal, keels smoothly curved, usually scabrous, not or narrowly winged distally, wings to 0.2 mm wide, lateral veins inconspicuous, apex acute; sterile florets 2, 1.5–2 mm long, less than  $\frac{1}{2}$  as long as the bisexual spikelets, subequal to equal, pubescent; bisexual florets 2.5–4.2 mm long; lemmas glabrous below, pubescent distally and on the margins, dull yellow when immature, shiny gray-brown

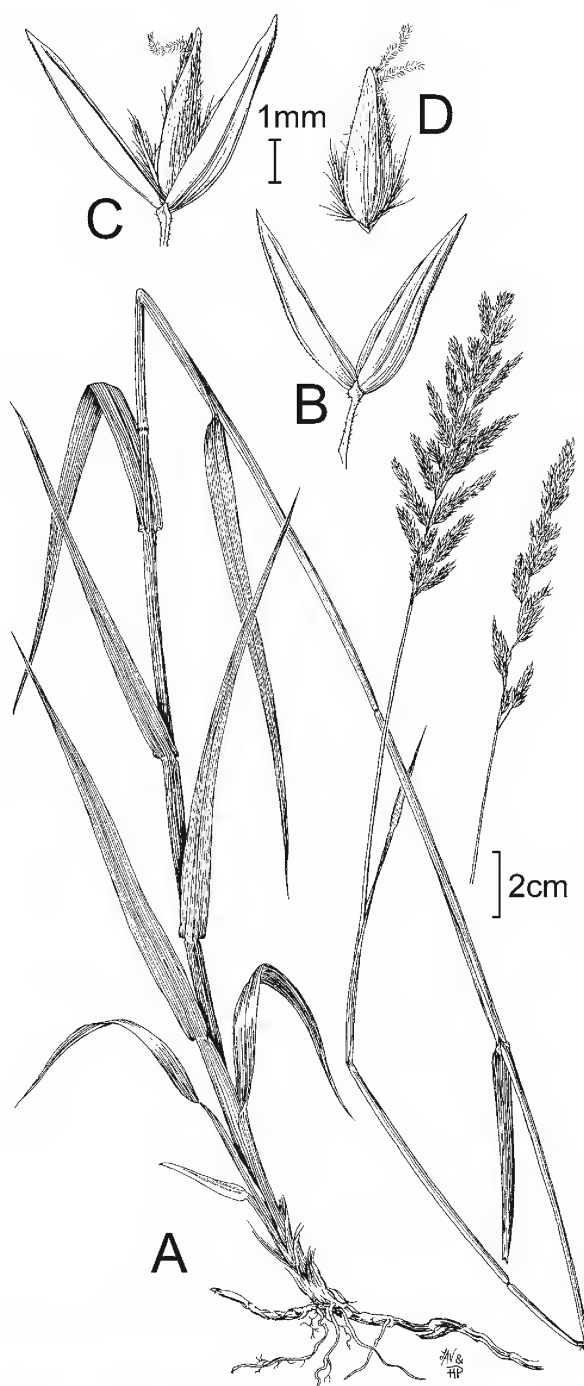


FIGURE 197. *Phalaris arundinacea*. A. Habit. B. Glumes. C. Spikelet. D. Florets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

to brown at maturity, apex acute; anthers 2.5–3 mm long.  $2n = 27, 28, 29, 30, 31, 35$ .

**DISTRIBUTION AND HABITAT.** *Phalaris arundinacea* is a circumboreal species, native to north temperate regions; it is introduced in the Southern Hemisphere. It grows in wet areas such as the edges of lakes, ponds, ditches, and creeks, often forming dense stands; in some areas it is a problematic weed.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Práxedes G. Guerrero: Rancho Escuela, km 65, 16 Aug 1997, cultivo de alfalfa, I. Enriquez, S. Ordoñez, L. Sushii, S. Carrasco, A. Perales & N. Loya IEA14 (UACJ).

311. *Phalaris canariensis*\* L., Sp. Pl. 1: 54–55. 1753.

FIGURE 198

Annual. Culms 30–100 cm tall. Ligules 3–6 mm long, rounded to obtuse, lacerate; blades 3–25 cm long, 2–10 mm wide. Panicles 1.5–5 cm long, 1.5–2 cm wide, ovoid to oblong-ovoid, continuous, not lobed, truncate at the base; branches not evident, the spikelets borne singly, not clustered. Spikelets homogamous, all spikelets with a bisexual floret; florets 3; disarticulation above the glumes, beneath the sterile florets; glumes 7–10 mm long, 2–2.5 mm wide, smooth, mostly glabrous, sometimes sparsely pilose between the veins, keels winged, the wings to 0.6 mm long, widening distally, lateral veins inconspicuous, smooth, apex rounded, mucronate; sterile florets 2, 2–4.5 mm long,  $\frac{1}{3}$  or more the length of the bisexual florets, equal or subequal, lanceolate, sparsely pubescent, acute; bisexual florets 4.5–6.8 mm long, ovate, densely pubescent, shiny, stramineous to gray-brown; anthers 2–4 mm long.  $2n = 12$ .

**DISTRIBUTION AND HABITAT.** *Phalaris canariensis* is native to southern Europe and the Canary Islands but is now widespread and is mostly grown for birdseed. This species has been reported from Chihuahua (Espejo Serna et al., 2000; Dávila et al., 2006).

312. *Phalaris caroliniana* Walter, Fl. Carol. 74. 1788.

FIGURE 199

Annual; not rhizomatous. Culms to 150 cm tall. Ligules 1.5–7 mm long, truncate to broadly acute; blades 1.5–15 cm long, 2–11 mm wide, smooth, shiny green, apex acuminate. Panicles 0.5–8(8.5) cm long, 0.8–2 cm wide, ovoid to subcylindrical; branches not evident, the spikelets borne singly, not clustered. Spikelets homogamous, all spikelets with a bisexual floret; florets 3; disarticulation above the glumes, below the sterile florets; glumes 3.8–6(8) mm long, 0.8–1.5 mm wide, keels smooth or scaberulous, narrowly to broadly winged distally, the wings 0.1–0.5 mm wide, entire, smooth, lateral veins prominent, usually smooth, sometimes scaberulous, apex acute or acuminate; sterile florets 2, 1.5–2.5 mm long,  $\frac{1}{2}$  or more the length of the bisexual florets, pubescent; bisexual florets 2.9–4.7 mm long, 0.9–1.8 mm wide, pubescent, shiny, stramineous when immature, brown when mature, apex acuminate to beaked; anthers 1.5–2 mm long.  $2n = 14$ .

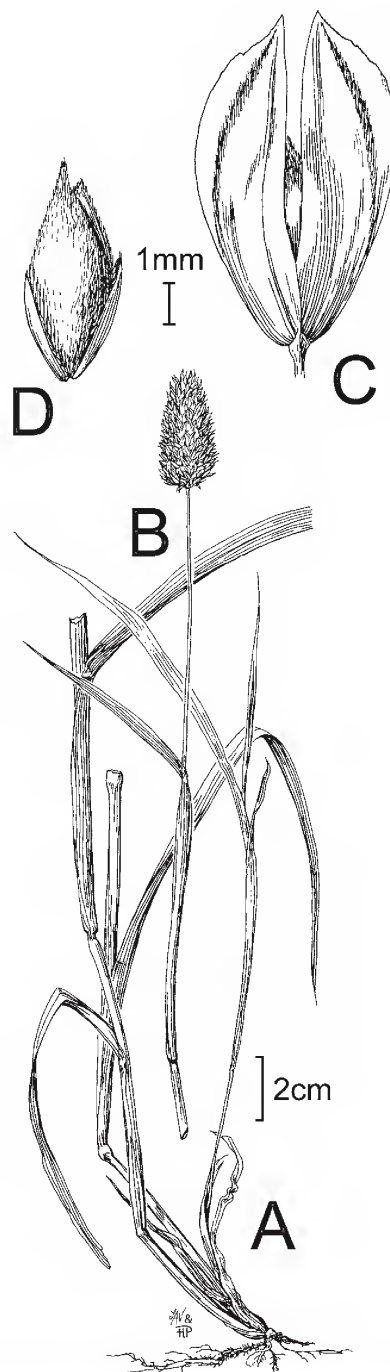


FIGURE 198. *Phalaris canariensis*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Florets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.





FIGURE 199. *Phalaris caroliniana*. A. Habit. B. Spikelet. C. Florets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Phalaris caroliniana* grows in wet, marshy, and swampy ground. It is a common species in much of southern United States and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ascensión:** alrededores del cruce [around the crossing] del río Casas Grandes con la carr. [hwy] Juárez–Ascensión, 11 Jun 2005, 1180 m, R. Corral, M. Vargas & H. Gutiérrez RCD 7155 (UACJ). **Chihuahua:** Vicinity of Chihuahua, 27 Apr 1908, 1300 m, E. Palmer 32 (US). **Práxedes G. Guerrero** (San Ignacio): a 2 km al S del poblado del mismo nombre [village of the same name], Rancho Escuela de la Univ. Autónoma de Cd. Juárez, 18 Mar 1995, 1090 m, R. Corral, P. Olivas & E. Pérez RCD6031 (UACJ); a 2 km del poblado Práxedes G. Guerrero (San Ignacio), Rancho Escuela de la Univ. Autónoma de Ciudad Juárez, 5 May 1995, maleza de acequia [ditch weed], 1090 m, R. Corral, Bye, A. Domínguez, K. Chico & A. Soutyrine RCD6083 (UACJ).

313. *Phalaris paradoxa*\* L., Sp. Pl. (ed. 2) 2: 1665. 1763.

FIGURE 200

Caespitose annual. Culms 20–100 cm tall, not swollen at the base. Ligules 3–5 mm long, truncate to acute; blades 5–10(15) cm long, 2–5 mm wide. Panicles 3–9 cm long, about 2 cm wide, dense, obovoid to clavate, tapering at the base, rounded to truncate at the top; branches with groups of 5–6 usually staminate, rarely sterile spikelets clustered around a terminal pistillate or bisexual spikelet, the spikelets homomorphic; pedicels hispid; disarticulation beneath the spikelet cluster. Spikelets heterogamous, some staminate or sterile, others bisexual or pistillate; florets 3, the lower 2 florets sterile, highly reduced, the terminal floret staminate, pistillate, or bisexual (rarely sterile); glumes of staminate or sterile spikelets to 9 mm long, usually narrowly winged and clavate, those of the spikelets at the base of the panicles reduced to knobs of tissue terminating the pedicels; glumes of pistillate or bisexual spikelets 5–8 mm long, about 1 mm wide, keeled, keels winged, the wings 0.2–0.4 mm wide, terminating below the apex and forming a single, prominent tooth, lateral veins conspicuous, apex acuminate to awned, awns about 0.5 mm; sterile florets of all spikelets 0.2–0.4 mm long, knoblike projections on the calluses of the terminal florets, often with 1–2 hairs; terminal florets of all spikelets 2.5–3.5 mm long, 0.8–1.5 mm wide, indurate, shiny, glabrous or with a few short hairs near the tip; anthers 1.5–2.5 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Phalaris paradoxa* is native to the Mediterranean region; it is now found throughout the world, primarily in waste areas and near old dumps. This species has been reported in Chihuahua (Espejo Serna et al., 2000; Dávila et al., 2006).

### ***Phragmites* Adans.**

Perennial; rhizomatous or stoloniferous, often forming dense stands. Culms leafy; internodes hollow. Leaves cauline, mostly glabrous; sheaths open; ligules membranous, ciliate; blades flat

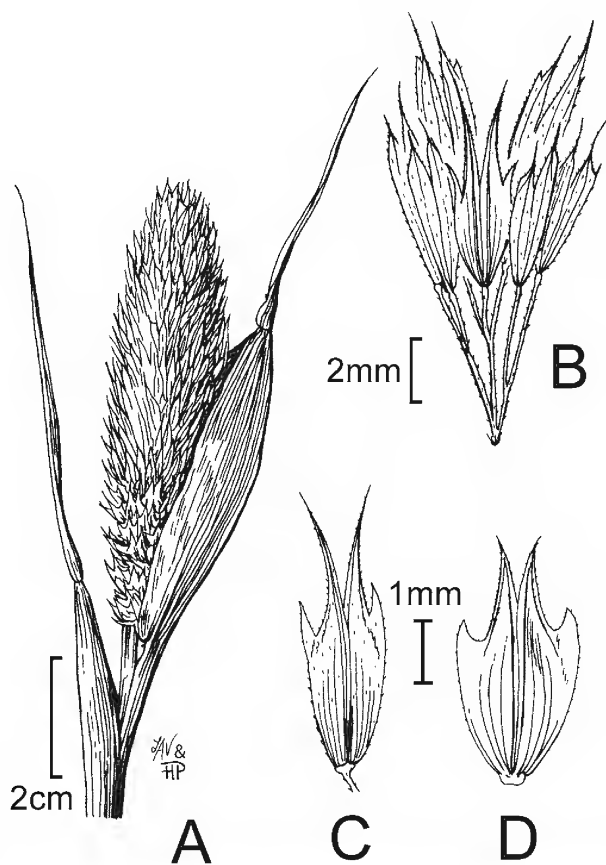


FIGURE 200. *Phalaris paradoxa*. A. Inflorescence. B. Inflorescence branch. C. Sterile spikelet. D. Fertile Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

or folded. Inflorescence terminal, a plumose panicle. Spikelets with 2–8 florets, weakly laterally compressed, lower 1–2 florets staminate, distal 1–2 florets rudimentary, remaining florets bisexual; rachilla internodes sericeous; disarticulation above the glumes and below the florets; glumes unequal, shorter than the florets, 1- to 3-veined, glabrous; lower glumes much shorter than the upper glumes; calluses pilose; lemmas 3-veined, glabrous, unawned; anthers 1–3. Caryopsis rarely maturing,  $\times = 12$ .

The genus is treated as having four species worldwide. *Phragmites australis* has been divided into three subspecies in North America and a key is included below even though no specimens have been seen by us (Saltonstall et al., 2004; Saltonstall and Hauber, 2007).

314. *Phragmites australis* (Cav.) Steud., Nomencl. Bot. (ed. 2) 1: 143. 1840. *Arundo australis* Cav., Anales Hist. Nat. 1(2): 100–101. 1799.

FIGURE 201

Culms 1–4 m tall, 0.5–1.5 cm thick, erect. Ligules 0.4–1.7 mm long; blades 15–40 cm long, 2–4 cm wide, long-acuminate, disarticulating from the sheath at maturity. Panicles 15–35 cm long, 8–20 cm wide, ovoid to lanceoloid, often purplish when young, straw-colored at maturity. Spikelets with 3–10 florets; rachilla hairs (4)6–10 mm long; lower glumes 2.5–6.5 mm long; upper glumes 4.5–11 mm long; lemmas 7.5–13.5 mm long, glabrous, linear, margins somewhat inrolled, apex long-acuminate; paleas 3–4 mm long, membranous; anthers 1.5–2 mm long, purplish; styles persistent. Caryopsis 2–3 mm long, rarely maturing.  $2n = 36, 42, 44, 46, 48, 49-54, 72, 84, 96, 120$ .

**DISTRIBUTION AND HABITAT.** *Phragmites australis* grows in wet or muddy ground along waterways, in saline or freshwater marshes, and in sloughs throughout North America. Its tall, leafy, often persistent culms and plumose panicles make it one of our easier species to recognize. This species is reported from Chihuahua in Espejo Serna et al. (2000), Dávila et al. (2006), and Herrera Arrieta and Cortés Ortiz (2010).

#### KEY TO SUBSPECIES OF *PHRAGMITES AUSTRALIS*

1. Ligules 1.0–1.7 mm long; lower glumes 3.0–6.5 mm long; upper glumes 5.5–11.0 mm long; lemmas 8.0–13.5 mm long; leaf sheaths caducous with age; culms exposed in the winter, smooth and shiny; rarely occurs in a monoculture . . . . . *P. australis* subsp. *americanus* Saltonstall, P. M. Peterson & Soreng (native lineage)
1. Ligules 0.4–0.9 mm long; lower glumes 2.5–5.0 mm long; upper glumes 4.5–7.5 mm long; lemmas 7.5–12.0 mm long; leaf sheaths not caducous with age; culms not exposed in the winter, smooth and shiny or ridged and not shiny; usually occurs as a monoculture.
  2. Culms smooth and shiny; throughout Mexico and Central America . . . . . *P. australis* subsp. *berlandieri* Saltonstall & Hauber (Gulf Coast lineage)
  2. Culms ridged and not shiny . . . . . *P. australis* subsp. *australis* (introduced lineage)

#### *Piptochaetium* J. Presl

**Perennial;** caespitose, not rhizomatous. **Culms** usually erect, sometimes decumbent, glabrous, not branched above the base; **basal branching** intravaginal; **prophylls** shorter than the

sheaths, mostly glabrous, keels usually with hairs, apex bifid, teeth; **cleistogenes** not developed. **Sheaths** open to the base, margins glabrous; **ligules** membranous, decurrent, truncate to acute, sometimes highest at the sides, sometimes ciliate; **blades** convolute to flat, translucent between the veins, often sinuous distally.

**Inflorescence** a terminal panicle, open or contracted, spikelets usually confined to the distal ½ of each branch. **Spikelets** with 1 floret; **rachillas** not prolonged beyond the base of the floret; **disarticulation** above the glumes, beneath the floret; **glumes** subequal, longer than the floret, lanceolate, 3- to 7(8)-veined; **florets** globose to fusiform, terete to laterally compressed; **calluses** well-developed, sharp or blunt, glabrous or antrorsely strigose, hairs yellow to golden brown; **lemmas** coriaceous to indurate, glabrous or pubescent, striate, particularly near the base, smooth, papillose, or tuberculate, often smooth on the lower portion and papillate to tuberculate distally, margins involute, fitting into the grooved palea, apex fused into a crown, awned,

lemmas often narrowed below the crown, crowns usually ciliate; **awns** caducous to persistent, usually twice-geniculate, first 2 segments usually twisted and hispid, terminal segment straight and scaberulous; **paleas** longer than the lemmas, similar in texture, glabrous, sulcate between the veins, apex prow-tipped; **lodicules** 2 or 3, membranous, glabrous, blunt or acute; **anthers** 3; **ovaries** glabrous; **styles** 2. **Caryopsis** terete to globose or lens-shaped.  $x = 11$ .

*Piptochaetium* is primarily South American, being particularly abundant in Argentina (Ciadella et al., 2007). There are eight species of *Piptochaetium* in Mexico, three of which are known to occur in Chihuahua (Espejo Serna et al., 2000).

#### KEY TO SPECIES OF PIPTOCHAETIUM

1. Florets 2.3–5 mm long; culms 35–95 cm tall ..... *P. fimbriatum*
1. Florets 5–10 mm long; culms 50–125 cm tall.
  2. Florets 6.5–10 mm long; leaf blades 1–3.5 mm wide, flat to loosely folded ..... *P. pringlei*
  2. Florets 5–6.5 mm long; leaf blades about 1 mm wide, tightly involute ..... *P. virescens*

**315. *Piptochaetium fimbriatum*** (Kunth) Hitchc., J. Wash. Acad. Sci. 23(10): 453. 1933. *Stipa fimbriata* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 126. 1815.

FIGURE 202

Culms 35–95 cm tall, usually glabrous, sometimes pubescent below the nodes; nodes 2–3, often dark, glabrous. Sheaths glabrous, smooth; ligules of basal leaves 0.4–1.8 mm long, of upper leaves 1.5–2 mm long, truncate to rounded; blades 6–26 cm long, 0.3–0.5 mm in diameter, usually involute, sometimes flat and 0.5–1(1.5) mm wide, 3-veined, glabrous, veins often scaberulous, margins scabrous. Panicles 6.5–25 cm long, open, often partially enclosed in the upper leaf sheath, with 20–60 spikelets; branches flexuous; pedicels 4–12 mm long, flattened, hispid; glumes 4–6.2 mm long, 1.8–3.1 mm wide, subequal, 5- to 7-veined, often partly purplish; florets 2.3–5 mm long, 0.6–1.9 mm thick, somewhat laterally compressed, obovate in side view, asymmetrical; callus 0.2–0.7 mm long, blunt, strigose; lemmas awned, tan to light chocolate brown, shiny, smooth, evenly pubescent when immature, hairs easily rubbed off; crowns about 0.8 mm wide, inconspicuous, glabrous or glabrate; awns 11–20 mm long, persistent, twice-geniculate; paleas about 3.5 mm long; lodicules about 1 mm long, 2; anthers 0.3–0.5 mm long, not penicillate. Caryopsis 2.5–3 mm long, 0.6 mm thick, fusiform.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Piptochaetium fimbriatum* is an attractive species that grows in oak and pinyon woods in the southwestern United States and adjacent Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, bosque de pino-encino [pine-oak forest], 2210 m, *P.M. Peterson, Annable & Valdés-Reyna* 10713 (CIIDIR, US). **Bocoyna:**

24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, *P.M. Peterson & J.M. Saarela* 22029 (US); Cacerera de la cañada de Recogoata, 22 Sep 1997, bosque de pino-encino en cañada, 2400 m, *B. Tab V. 36* (MEXU); along old railroad bed and old road between Creel and Bacoyna near tunnel, 13 Jul 1973, *Bye* 4214 (MEXU). **Chihuahua:** 32 km W of hwy 45 towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2110 m, *P.M. Peterson & Annable* 12548 (US); Sta. Clara Canyon, 10 Oct 1935, *LeSueur Mex-075* (US); 16.7 mi W of hwy 45 on road up Los Prietos Canyon, 18 Oct 1992, 2120 m, bosque de pino, 2120 m, *P.M. Peterson & Annable* 12596 (US); rancho Tepehuanes de chihuahua hacia [toward] Namiquipa desviar [divert] en “Ocampo 73” a la izq terrac [to left dirt road] 6 km, 13 Oct 2000, pastizal mediano abierto [mostly open grassland], *G. Gómez* 330 (MEXU). **Cuauhtémoc:** 21 km W of Cuauhtemoc, on Hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable* 9594 (US). **Cusihuiriachic:** Rancho el Coronel, 2 Sep 1981, bosque esclero-aciculifolio [narrow-leaved sclerophyllous forest], *Loya & Méndez* 1508 (MEXU). **Guachochi:** Parque Nacional Barranca del Cobre, 24.8 km NE of La Bufa on road to Samachic, 2440 m, *P.M. Peterson, Annable & Valdés-Reyna* 10801 (US). **Guadalupe y Calvo:** 9.5 mi E of Guadalupe y Calvo on hwy 24 and 5 mi W of El Ocote, 14 Sep 2006, *P.M. Peterson* 20057, *F. Sánchez Alvarado & E.P. Gómez Ruiz* (CIIDIR, US). **Guazapares:** Above waterfalls at Wasachic, SW of Rokoroibo, 25 Jul 1974, 1875 m, *Bye* 6494 (NMC). **Guerrero:** Barranca Colorada, Sierra Gazachic, 35 km S of Miñaca, 2500 m, *Pennell* 18940 (US); Miñaca, *Hitchcock* 7741 (US) 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, *P.M. Peterson, Annable & Y. Herrera* 7985 (ENCB, US); 37 km SW of La Junta on road to Creel at the puente [bridge] Arroyo Ancho, 10 Sep 1989, pine forest, 2230 m, *P.M. Peterson, Annable & Y. Herrera* 7997 (ENCB, US); 10 km S de La Junta, carr. [hwy] La Junta–Tomochi, 6 Oct 74, bosque de pino-encino,



FIGURE 201. *Phragmites australis*. A. Rhizome. B. Culm and inflorescence. C. Spikelet. D. Floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

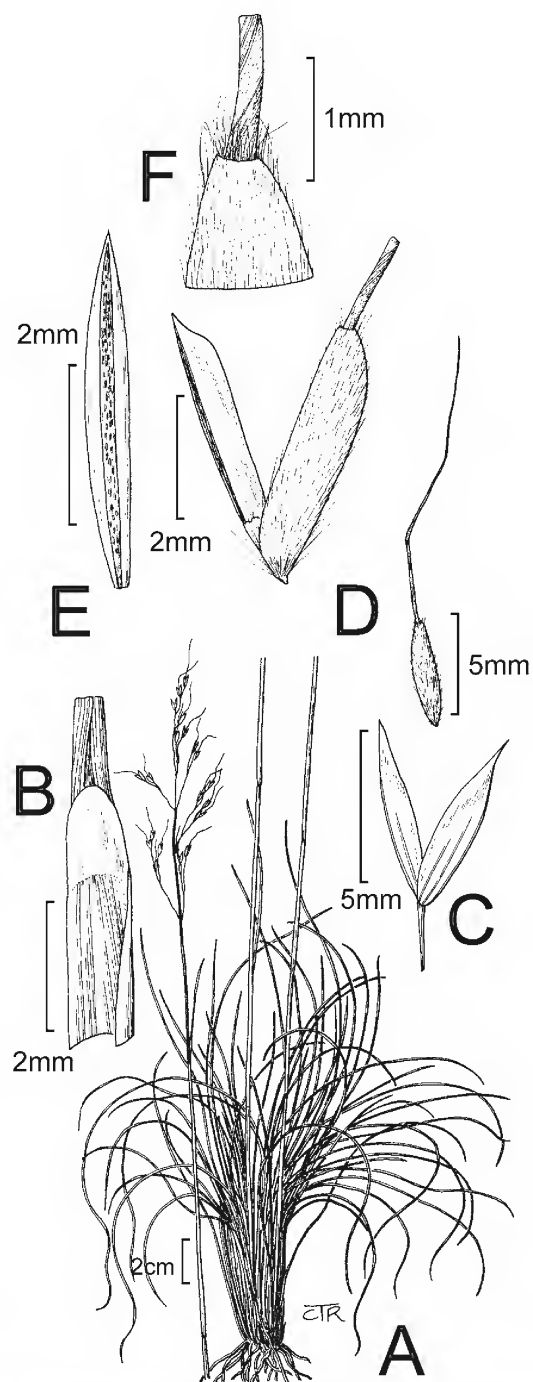


FIGURE 202. *Piptochaetium fimbriatum*. A. Habit. B. Ligule. C. Glumes. D. Floret. E. Palea. F. Apex of lemma. Drawn by Cindy Roché; copyright Utah State University.

1900 m, *Valdés-Reyna VR-709* (RELC); Entre [between] La Junta & Tomochi, 13 Aug 1976, bosque de pino-encino, 2195 m, *S. González & J.M. Peña 594* (RELC); Tomochi 2 km alrededor del poblado [around the village], 24 de Sep 1997, bosque de pino, 2100 m, *M.A. Vergara 162* (MEXU); 4 km al poblado de Tomochic km 210 sobre carr. Chihuahua Basaseachi, 24 Sep 1997, bosque de pino, 2200 m, *B. Tab V. 165* (MEXU); carr. La Junta-San Ignacio 17 km, 22 Sep 1997, 2290 m, *B. Tab V. 7* (MEXU); ca. 0.5 mi N of El Alamito on road between San Juanito and San Pedro, 2 Aug 1977, pine-oak, 2125 m, *Bye 7860* (MEXU). **Madera:** Proximidad a la Col. Chuichupa, 1 sep 1990, bosque de junipero [juniper grove], 2240 m, *A. Benítez 2175* (CIIDIR). **Namiquipa:** 72.5 km S of Ignacio Zaragoza on Mex 23, 28 Sep 1989, pine woods, 28 Sep 1989, 2300 m, *P.M. Peterson & R.M. King 8170* (ENCB). **Ocampo:** Parque Nacional "Cascada de Basaseachic", 5 Aug 1994, 1900 m, *C. Yen & E. Estrada 2853* (NMC); Rio Basaseachic river canyon, 1.9 mi by road along the river canyon northward from Mexico Hwy 16 between villages of Baquiriachic and Basaseachic ca. 5 km N of Cascada de Basaseachic, 5 Jul 1994, pine-oak, 2060 m, *R.S. Felger, M. Wilson, G. Ferguson, M. Fishbein & S. MacMahon 94-260A* (MEXU); beside the road near Ocampo, Rio Mayo Region, 26 Jul 1990, pine-oak woodland, 2000 m, *P. Jenkins 90-292* (ARIZ). **Riva Palacio:** Majalca, 11 Oct 1939, *L. H. Harvey 1458* (US); Col. Cumbres de Majalca, approx. 32.2 km W of hwy 45 N of Chihuahua, 23 Sep 1988, pine woods, 1800 m, *P.M. Peterson & Annable 5807* (ENCB, US); Col. Cumbres de Majalca, approx. 32.2 km W of hwy 45 N of Chihuahua, 22 Sep 1988, pine woods, 1800 m, *P.M. Peterson & Annable 5811b* (ENCB, US); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera 7950* (ENCB, US); Rancho las carr.s de Chihuahua hacia Namiquipa desviar en "Ocampo 73" a la izq terrac 12 km, 7 Oct 2000, bosque abierto con encino & pino, *G. Gómez 215* (MEXU). **Temosachi:** Temosachi, 5 Sep 1988, 1800 m, *Laferr. 1923* (MEXU).

316. *Piptochaetium pringlei* (Beal) Parodi, Revista Mus. La Plata, Secc. Bot. 6(25): 230, f. 1D. 1944. *Oryzopsis pringlei* Beal, Bot. Gaz. 15(5): 112. 1890.

FIGURE 203

**Culms** 50–125 cm long, mostly glabrous, pubescent below the nodes; **nodes** 2–3, dark, glabrous or slightly pubescent. **Sheaths** smooth to scaberulous; **ligules** of basal leaves 0.5–2.8 mm long, truncate to rounded; of upper leaves 1–3.5 mm long, rounded to acute; leaf **blades** 10–30 cm long, 1–3.5 mm wide, flat to loosely folded, prominently 3- to 5-veined, abaxially glabrous, smooth, adaxially smooth or scabrous over the veins, margins smooth or scabrous. **Panicles** 6–20 cm long, open, with 10–25 spikelets, **branches** ascending, spreading, flexuous; **pedicels** to 1 mm long, flattened, hispid; **glumes** subequal, 9–12 mm long, 2.5–3.5 mm wide; **lower glumes** 5- to 7-veined; **upper**

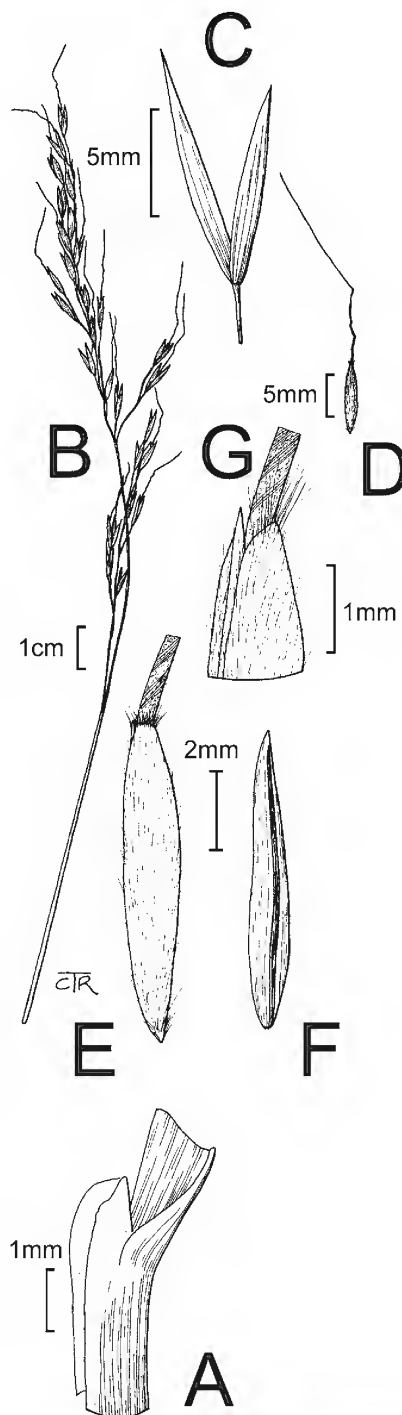


FIGURE 203. *Piptochaetium pringlei*. A. Ligule. B. Inflorescence. C. Glumes. D. Floret. E. Floret, magnified. F. Palea. G. Apex of lemma. Drawn by Cindy Roché; copyright Utah State University.



**glumes** 7-veined; **florets** 6.5–10 mm long, 1.5–2.1 mm thick, symmetrically oblong, terete to somewhat laterally compressed; **calluses** 0.6–1.9 mm long, blunt to acute, strigose; **lemmas** 6.5–10 mm long, golden brown to dark brown at maturity, shiny or not, smooth to spiny-tuberculate distally or for almost their entire length, densely pubescent, hairs tawny to golden brown, evenly distributed or somewhat more abundant on the basal ½, apex tapering to the crown; **crowns** 0.5–0.6 mm long, inconspicuous, straight, hairy, the hairs 0.5–1 mm long; **awns** 19–27(35) mm long, persistent, twice-geniculate, sometimes inconspicuous; **paleas** 6.3–9.5 mm long; **lodicules** 2, 1–1.5 mm long, acute; **anthers** 3.5–5.5 mm long, sometimes penicillate. **Caryopsis** about 7 mm long, fusiform.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Piptochaetium pringlei* grows in oak woodlands, often on rocky soils, in the southwestern United States and northwestern Mexico. It is often confused with *P. fimbriatum* but differs from that species in having longer florets and sharper calluses.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Sánchez, 12 Oct 1910, *Hitchcock* 7681 (US); 7677 (US); Cabecera de la cañada de Recogoata, 22 Sep 1997, bosque de pino-encino [pine-oak forest], 2400 m, *B. Tab V. 53* (MEXU); Moist llano [flat] Sw de Creel near San Ignacio, 17 Oct 1977, pine forest, *Bye & A.W. Weber* 8272 (MEXU). **Guerrero:** Barranca Colorada, Sierra Gazachic, 35 km S of Miñaca, 2500 m, *Pennell* 18929 (US). **Guachochi:** 24.6 km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, *P.M. Peterson, Annable & Valdés-Reyna* 10781 (US); km 85 carr. [hwy] Balleza–Guachochic, 24 Sep 1981, bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 2300 m, *M.E. Siqueiros* 1600 (MEXU). **Guerrero:** 37 km SW of La Junta on road to Creel at the puente [bridge] Arroyo Ancho, 10 Sep 1989, pine forest, 2230 m, *P.M. Peterson, Annable & Y. Herrera* 7996 (ENCB, US); along río Corareachi, 30 Aug 2003, 1840–1900 m, *P.M. Peterson & P. Catalán* 17596 (US); carr. La Junta–San Juanito, 17 km, 22 Sep 1997, 2290 m, *B. Tab V. 18-A* (MEXU). **Juárez:** 5 km de Lalolandia, 27 Oct 1977, bosque de pino-encino, 2100 m, *J.M. Peña* 778 (RELC). Sierra Madre, 5 Oct 1887, *C.G. Pringle* 1410 (US), Isotype.

317. *Piptochaetium virescens* (Kunth) Parodi, *Revista Mus. La Plata, Secc. Bot.* 6(25): 230. 1944.

Caespitose perennial; densely clumped. Culms 100–120 cm tall, wiry. Leaf blades 15–30 cm long, 1 mm wide, involute, filiform. Panicles 10–25 cm long, narrow, lanceolate; primary branches 5–10 cm long, appressed. Spikelets 6–8.5 mm long, oblong, laterally compressed, breaking up at maturity, disarticulating below each floret; florets 5–6.5 mm long; callus 1 mm long, evident, pubescent, acute; glumes 6–8.5 mm long, exceeding apex of florets, elliptic, 3-veined, membranous, equal, purple, persistent, thinner than fertile lemma, apices acute; fertile lemmas 5–6.5 mm long, symmetrically oblong, subterete, indurate, awned, surface papillose, pubescent, margins involute, interlocking with palea keels, the hairs tawny, apex truncate; crown a

ring of hairs of 0.5 mm long; lemma awn 15–20 mm long overall, twice-geniculate with twisted column; palea as long as the lemma, 2-veined, keels contiguous above a sulcus.

**DISTRIBUTION AND HABITAT.** *Piptochaetium virescens* grows in Mexico, Central America, and South America; the species is uncommon in Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cuesta Prieta, 10 km después de la estación [after station] San Juanito, rumbo [course] a Creel, 11 Aug 1997, bosque de pino-encino [pine-oak forest], 2520 m, *A. Espejo* 5771, *A.R. López Ferrari, J. Ceja, A. Mendoza & B. Pérez* (CIIDIR, UAMIZ).

## *Poa* L.

**Annual** or perennial; usually synoecious, sometimes monoecious, gynodioecious, dioecious, and/or asexual; with or without rhizomes or stolons, densely to loosely tufted or the culms solitary. **Basal branching** intravaginal, pseudointravaginal, or extravaginal; **prophylls** of intravaginal shoots 2-keeled and open, of pseudointravaginal shoots not keeled and tubular, of extravaginal shoots scalelike. **Culms** hollow, usually unbranched above the base. **Sheaths** from almost completely open to almost completely closed, terete or weakly to strongly compressed; **auricles** absent; **ligules** membranous, truncate to acuminate; **blades** flat, folded, or involute, adaxial surfaces with a groove on each side of the midvein, other intercostal depressions shallow, indistinct, apex often prow-shaped. **Inflorescences** usually terminal panicles, rarely reduced and raceme-like. **Spikelets** usually laterally compressed, infrequently terete to subterete, usually lanceolate, sometimes ovate; **florets** (1)2–6(13), usually sexual, sometimes bulb-forming; **rachillas** usually terete, sometimes prolonged beyond the base of the distal floret; **disarticulation** above the glumes and beneath the florets; **glumes** usually shorter than the lowest lemma in the spikelet, usually keeled, 1- to 3(5)-veined, unawned; **calluses** blunt, usually terete or slightly laterally compressed, sometimes slightly dorsally compressed, glabrous or hairy, hairs often concentrated in 1(3) tufts or *webs*, sometimes distributed around the calluses below the lemmas as a *crown of hairs*; **lemmas** usually keeled, infrequently weakly keeled or rounded, similar in texture to the glumes, 5(7–11)-veined, lateral veins sometimes faint, margins scarious-hyaline distally, apex scarious-hyaline, truncate or obtuse to acuminate, unawned; **paleas** from ⅔ as long as to subequal to the lemmas, distinctly 2-keeled, margins and intercostal regions milky white to slightly greenish; **lodicules** 2, broadly lanceolate, glabrous, lobed; **functional anthers** (1–2)3; **ovaries** glabrous. **Caryopsis** ellipsoidal, often shallowly ventrally grooved, solid.  $x = 7$ .

*Poa* includes about 550 species worldwide and is found principally in temperate and boreal regions (Soreng et al., 2017b). There are 23 species of *Poa* in Mexico, and 6 are known from Chihuahua (Soreng and Peterson 2012).

## KEY TO SPECIES OF POA

1. Annual; palea keels distinctly pubescent in part, rarely glabrous but then smooth.
  2. Floret callus with cobwebby hairs; panicles contracted; palea keels with some apical hooks ..... *P. bigelovii*
  2. Floret callus glabrous; panicles open; palea keels without hooks ..... *P. annua*
1. Perennial; palea keels glabrous, or sometimes pubescent, but always scabrous in part.
  3. Plants without rhizomes or lateral shoots, densely tufted ..... *P. strictiramea*
  3. Plants with well-developed rhizomes; loosely tufted.
    4. Panicles contracted, fairly dense, or slightly open; uppermost culm leaf blades highly reduced or absent; populations dioecious or pistillate; callus glabrous; plants of the northern mountains ..... *P. fendleriana*
    4. Panicles loosely contracted to open; uppermost culm leaf blades usually well-developed; plants all perfect-flowered, or if pistillate or staminate, then panicles open; callus, at least of proximal lemmas, with cobwebby hairs, or glabrous.
      5. Leaf blades mostly involute, mostly 1–2 mm wide (expanded), both surfaces moderately to densely scabrous; callus glabrous (rarely with a few short hairs); lemma keel and marginal veins glabrous or puberulent (hairs to 0.25 mm), sometimes puberulent between the veins near the base; plants from uplands of the Chihuahuan Desert ..... *P. strictiramea*
      5. Leaf blades flat or folded, some or most more than 2 mm wide, or if involute in part, then surfaces smooth or nearly so; callus with a dorsal tuft of wooly hairs; lemma glabrous or variously pubescent; plants widespread.
        6. Rachilla internodes usually exposed in side view; spikelets 4.5–8 mm long; lemmas glabrous or variously pubescent; ligules truncate to obtuse to acute, sometimes irregularly dentate to lacerate, 0.8–6 mm long; rhizomes usually short and/or poorly developed ..... *P. matri-occidentalis*
        6. Rachilla internodes mostly hidden from view; spikelets mostly 3–6 mm long; lemmas glabrous between the keel and marginal veins; ligules truncate to low rounded, entire, usually 1–2 mm long; plants with an extensive and spreading rhizome system ..... *P. pratensis*

318. *Poa annua*\* L., Sp. Pl. 1: 68. 1753.

FIGURE 204

Plants usually annual, rarely surviving for a second season; not rhizomatous, sometimes stoloniferous, densely tufted; basal branching intravaginal, innovations common, similar to the culms. Culms 2–20(45) cm tall, prostrate to erect, slender; nodes terete, usually 1 exserted. Sheaths closed for about 1/3 their length, terete or weakly compressed, smooth; ligules 0.5–3(5) mm long, smooth, glabrous, decurrent, obtuse to truncate; blades 1–10 cm long, 1–3(6) mm wide, flat or weakly folded, thin, soft, smooth, margins usually slightly scabrous, apex broadly prow-shaped. Panicles 1–7(10) cm long, lengths 1.2–1.6 times widths, erect; nodes with 1–2(3) branches; branches ascending to spreading or reflexed, straight, terete, smooth, with crowded or loosely arranged spikelets. Spikelets 3–5 mm long, laterally compressed; florets 2–6; rachilla internodes smooth, glabrous, concealed or exposed, distal internodes less than 1/2(3/4) the length of the distal lemma; glumes smooth, distinctly keeled, keels smooth; lower glumes 1-veined; upper glumes shorter than or subequal to the lowest lemma; calluses glabrous; lemmas 2.5–4 mm long, lanceolate, distinctly keeled, smooth throughout, the keels, marginal veins, and, usually, lateral veins crisply puberulent to long-villous, rarely glabrous throughout, lateral veins prominent, intercostal regions glabrous, margins smooth, glabrous, apex obtuse to acute; palea keels smooth, usually short- to long-villous, rarely glabrous; anthers 0.6–1.1 mm long, oblong prior to dehiscence, those of the upper 1–2 florets usually vestigial.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Poa annua* is one of the world's most widespread weeds. It thrives in anthropomorphic habitats outside the Arctic. A native of Eurasia, it is now well established throughout most of Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** S of Creel, S of the arroyo crossing on the old road below San Ignacio, 20 May 1973, 2250 m, Bye 3773 (NMC); Creel, 20 Sep 2003, Tenorio, J. Rodríguez, M. Hilerio & E. Zárate 23768 (US). **Chihuahua:** Vicinity of Chihuahua, 4–27 Apr 1908, E. Palmer 28 (US); 11 Abr [Apr] 1886, C.G. Pringle s/n (MEXU). **Guachochi:** 2.3 mi W of San Juanito on road towards Baquiriachic, 5 Oct 2000, P.M. Peterson & J. Cayouette 15361 (US). **Juárez:** Universidad Autónoma de Ciudad Juárez, Campus ICB, 15 Abr 2005, 1118 m, R. Corral, M. Vargas & D. Alvarado RCD7085 (UACJ). **Guadalupe y Calvo:** near Cumbre Mohinora, 13 Sep 2006, 3300 m, P.M. Peterson 20033, E. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Madera:** Arroyo de las Garrochas, ejido El Largo, 28 Aug 1990, bosque mixto de coníferas & latifoliadas [mixed conifer and broadleaf forest], 2600 m, O. Bravo 1319 (CIIDIR, MEXU); Ciénega de la Vibora, ejido El Largo, 14 Oct 1990, 2300 m, bosque de pino-encino [pine-oak forest], O. Bravo 1910 (CIIDIR); Arroyo de la Quinta, ejido El Largo, 13 Oct 1990, bosque de *Pinus-Quercus-Pseudotsuga*, 2100 m, A. Benítez 2848 (CIIDIR). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” at base falls, 26 Apr 1985, 1570 m, Spellenberg, R. Soreng & R. Corral 8019 (NMC). 27 mi W of Tomochic on road to Basaseachic, 25 Apr 1986, 2100 m, Spellenberg, Soreng, R. Corral, T. Lebgue 8417

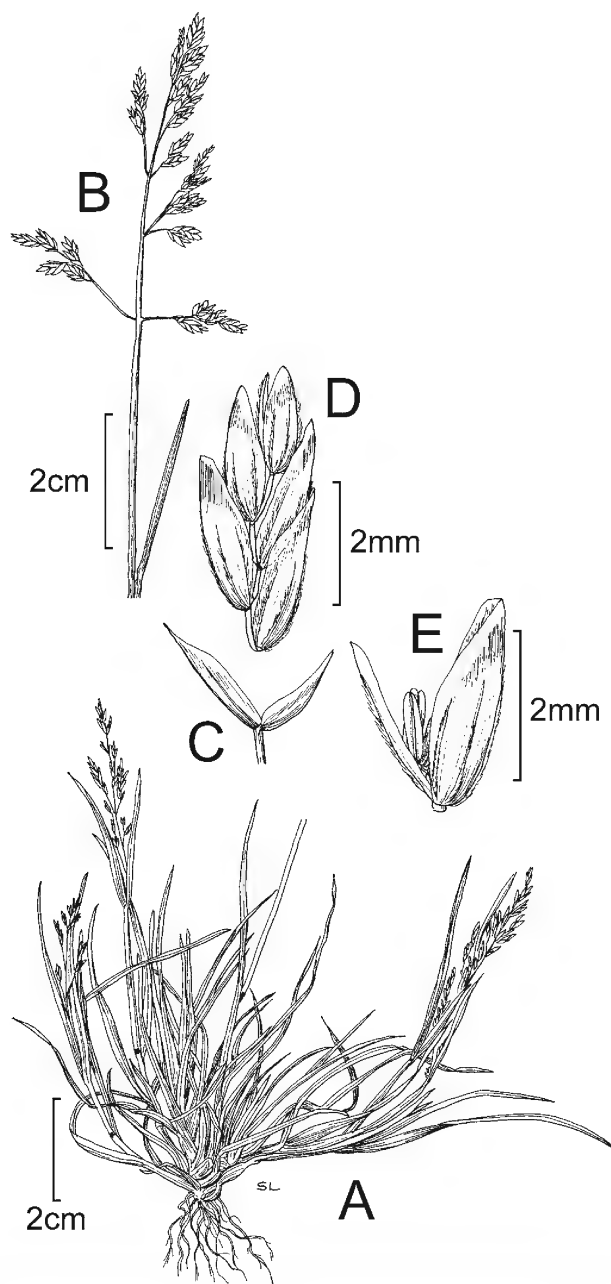


FIGURE 204. *Poa annua*. A. Habit. B. Inflorescence. C. Glumes. D. Florets. E. Floret. Drawn by Sandy Long; copyright Utah State University.

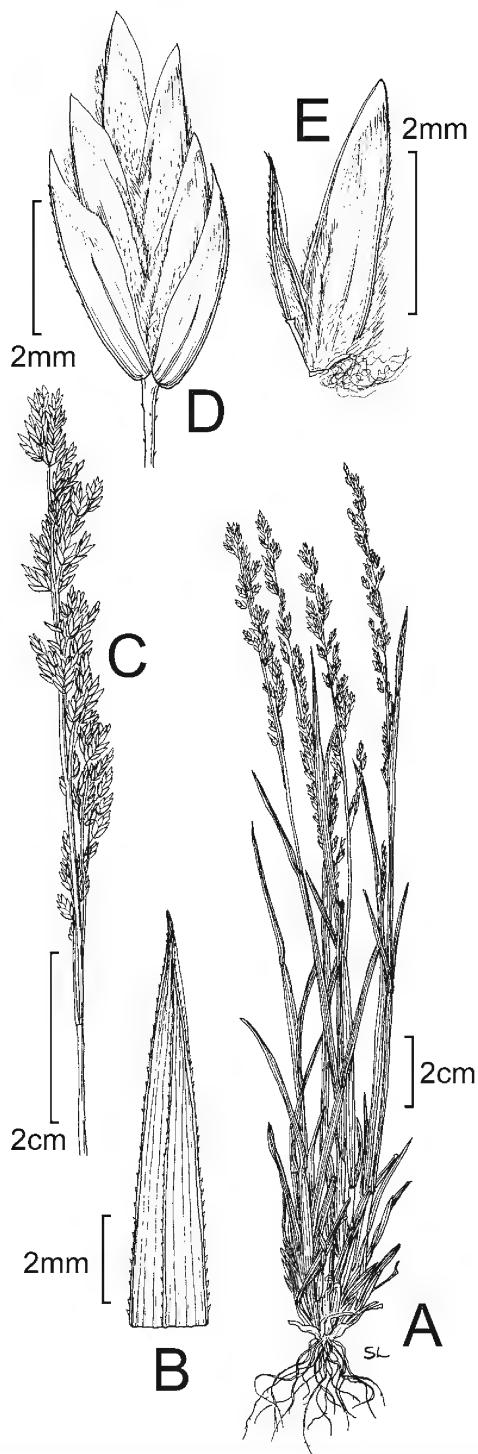


FIGURE 205. *Poa bigelovii*. A. Habit. B. Apex of leaf blade. C. Inflorescence. D. Spikelet. E. Floret. Drawn by Sandy Long; copyright Utah State University.

(NMC); Parque Nacional Cascada basaseachic, áreas de campamento [camp area], cerca [near] del arroyo, 23 Sep 1990, bosque de pino-encino, 1980 m, R. Corral RCD3978 (UACJ).

319. *Poa bigelovii* Vasey & Scribn., Descr. Cat. Grass. U.S. 81. 1885. *Poa annua* var. *stricta* Vasey ex Scribn., Bull. Torrey Bot. Club 10(1): 31. 1883.

FIGURE 205

Plants usually annual, rarely longer-lived; densely tufted, tuft bases narrow, usually without sterile shoots, not stoloniferous, not rhizomatous; basal branching intravaginal. Culms (2)5–60 (70) cm tall, 0.3–1 mm thick, usually erect, bases rarely geniculate; nodes terete, usually 1 exserted. Sheaths closed for  $\frac{1}{4}$ – $\frac{1}{2}$  their length, usually compressed and keeled, smooth or the keels scabrous; ligules 2–6 mm long, smooth or scabrous, usually decurrent, obtuse to acute; blades 1.5–5 mm wide, flat, thin, soft, finely scabrous, apex broadly prow-shaped, cauline blades (1)4–15 cm long, flag leaf blades usually 1–4 cm long. Panicles (1)5–15 cm long, erect, cylindrical, contracted, sometimes interrupted, congested, with 2–3(5) branches per node; branches erect or steeply ascending, smooth or sparsely to densely scabrous. Spikelets 4–7 mm long, laterally compressed; florets 3–7; rachilla internodes to 1 mm long, smooth, glabrous; glumes subequal, distinctly keeled, keels and sometimes the lateral veins scabrous; lower glumes 1(3)-veined; upper glumes shorter than or subequal to the lowest lemmas; calluses webbed; lemmas 2.6–4.2 mm long, lanceolate, distinctly keeled and smooth, keels, marginal veins, and sometimes the lateral veins short- to long-villous, keels hairy to near the apex, marginal veins to  $\frac{2}{3}$  their length, lateral veins obscure to moderately prominent, intercostal regions glabrous or softly puberulent, upper margins white, apex acute; palea keels softly puberulent to short-villous at midlength, scabrous near the apex, intercostal regions usually softly puberulent; anthers 1–3, 0.2–1 mm long.  $2n = 28, 28 + I$ .

**DISTRIBUTION AND HABITAT.** *Poa bigelovii* grows in arid upland regions, particularly on shady, rocky slopes in the southwestern United States and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Asunción:** Canyon in N face of Sierra Rica, S of Rancho La Consolación, 3 May 1973, matorral [scrub], 1400–2000 m, M.C. Johnston, T.L. Wendt & F. Chiang 10776 (MEXU). **Chihuahua:** cerca [near] del Rio Chihuahua, 5 Apr 1886, C.G. Pringle s.n. (MEXU). **Juárez:** Mountains near Paso del Norte, Mar 1881, Vasey s.n. (US). Mpio.: Cañón de Tinaja de Corazón, east flank of Sierra de Mulato on Rio Grande 29°13'N, 103°45'W [29.21667°N, 103.75000°W], 750 m, 13 Mar 1986, M.C. Johnston 12898 (TEX).

320. *Poa fendleriana* (Steud.) Vasey, U.S.D.A. Div. Bot. Bull. 13(2): t. 74. 1893. *Uralepis poaeoides* Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 94. 1862.

FIGURE 206

Perennial; densely to loosely tufted, rhizomatous, often weakly so, rhizomes usually short and inconspicuous; basal branching mainly intravaginal, usually some extravaginal. Culms 15–70 cm tall, sometimes stout, erect or the bases decumbent, terete or weakly compressed; nodes terete, 0–1 exserted. Sheaths closed for about  $\frac{1}{3}$  their length, terete, smooth or scabrous, glabrous or occasionally retrorsely pubescent, bases of basal sheaths glabrous, distal sheath lengths usually (5)9+ times blade lengths; collars smooth or scabrous, glabrous or hirsute; ligules 0.2–18 mm long, smooth or scabrous, decurrent or not, apex truncate to acuminate, ciliate or glabrous; innovation blades usually moderately to densely scabrous or hirsute on and between the veins, infrequently nearly smooth and glabrous; cauline blades strongly reduced in length distally, (0.5)1–3(4) mm wide, usually involute, moderately thick and firm, infrequently moderately thin, abaxial surfaces usually smooth, infrequently scabrous, apex narrowly prow-shaped, steeply reduced in length distally along the culm, flag leaf blades often absent or very reduced, sometimes to 1(3) cm. Panicles 2–12(30) cm long, erect, contracted, narrowly lanceoloid to ovoid, congested, frequently with 100+ spikelets; nodes with 1–2 branches; branches 1–8 cm long, erect, terete to weakly angled, smooth or scabrous, with 3–15(25) spikelets. Spikelets (3)4–8(12) mm long, lengths to 3 times widths, broadly lanceolate to ovate, laterally compressed, not sexually dimorphic; florets 2–7(13); rachilla internodes 0.8–1.3 mm long, smooth, glabrous or hairy, hairs to 0.3 mm long; glumes lanceolate, distinctly keeled; lower glumes 1- to 3-veined, distinctly shorter than the lowest lemmas; calluses glabrous; lemmas 3–6 mm long, lanceolate, distinctly keeled, keels, marginal veins, and lateral veins glabrous or short- to long-villous or softly puberulent, lateral veins moderately prominent, intercostal regions softly puberulent or glabrous, smooth or sparsely scabrous, margins glabrous, apex acute; palea keels scabrous, sometimes softly puberulent or long-villous at midlength, hairs to 0.4 mm long; anthers vestigial (0.1–0.2 mm) or 2–3 mm long.  $2n = 28 + II, 56, 56-58, 58-64$ .

**DISTRIBUTION AND HABITAT.** *Poa fendleriana* grows on rocky to rich slopes in sagebrush scrub, interior chaparral, high plains grasslands to forests and from desert hills to low alpine habitats. Its range extends from British Columbia to Manitoba and south to Mexico.

#### KEY TO SUBSPECIES OF *POA FENDLERIANA*

1. Lemmas glabrous; plants from the Sierra Madre Occidental . . . . . *P. fendleriana* subsp. *albescens*
1. Lemmas pubescent on the keel and marginal veins; plants more widespread . . . . . *P. fendleriana* subsp. *fendleriana*

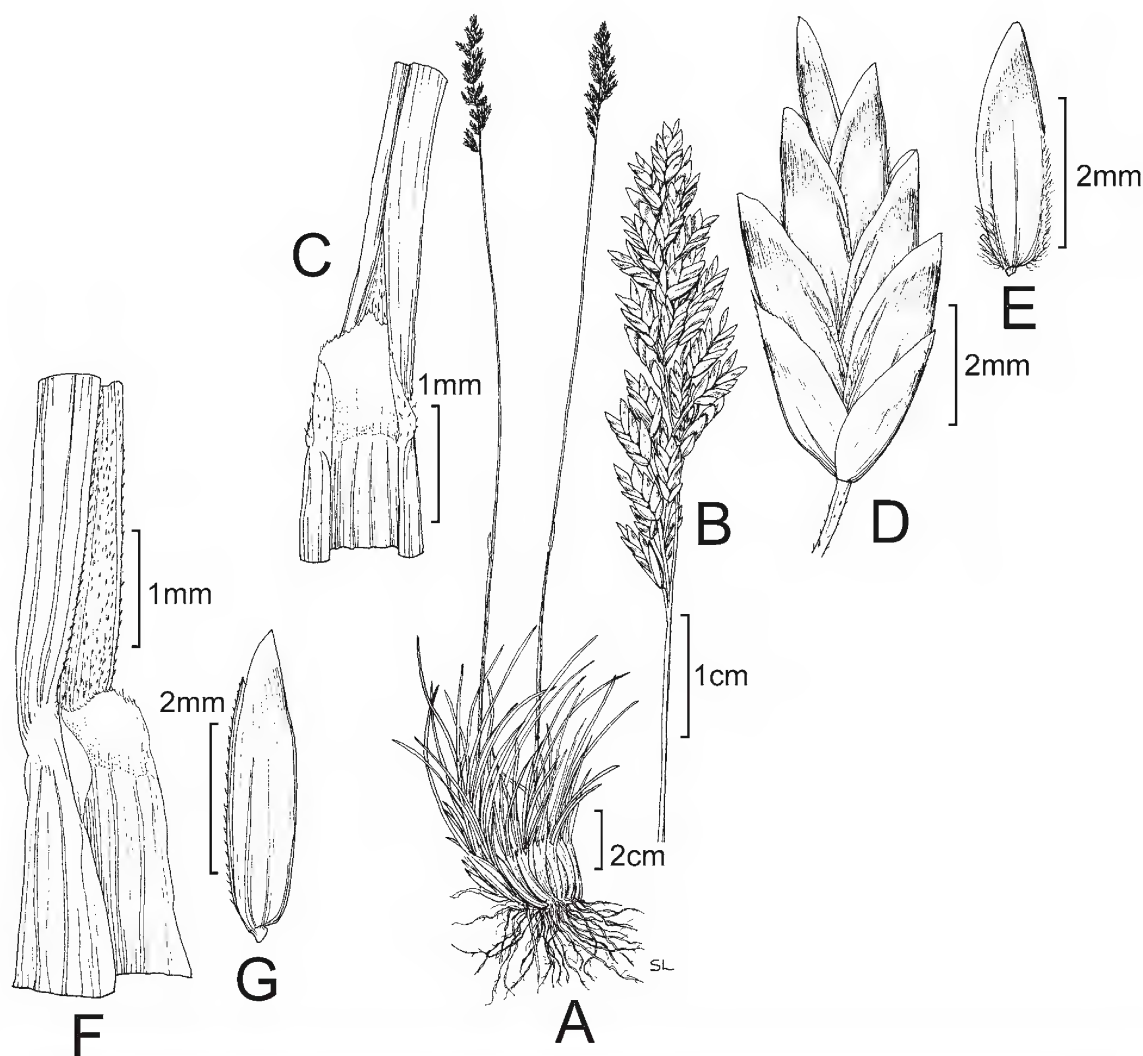


FIGURE 206. *Poa fendleriana* subsp. *fendleriana*. A. Habit. B. Inflorescence. C. Ligule. D. Spikelet. E. Lemma. *Poa fendleriana* subsp. *albescens*. F. Ligule. G. Lemma. Drawn by Sandy Long; copyright Utah State University.

*Poa fendleriana* subsp. *albescens* (Hitchc.) Soreng

**DISTRIBUTION AND HABITAT.** The subspecies is endemic to southeastern Arizona and southwestern New Mexico in the United States and is known from Chihuahua and Sonora in Mexico (Soreng and Peterson, 2012).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ascensión:** Canyon in N face of Sierra Rica, S of Rancho La Consolación, 3 May 1973, Matorral [scrub], 1400–2000 m, M.C. Johnston, T.L. Wendt & F. Chiang 729804 (MEXU). **Bocoyna:** San Juanito, ca 18 km W near Headwaters of Rio Oteros origin above Arroyo El Ranchito, 27°57.5'N, 107°45'W [27.95833°N, 107.75000°W], 29 Apr 1985, 2430 m, Soreng & Spellenberg

2618 (NMC); W of Creel, S of Rio Oteros, 6 May 1973, bosque [forest] de pine and oak, 7200 ft, Bye 3673 (MEXU); Arroyo del Gato, ca 25 air km WSW of San Juanito, 1.5 km W of Talayotes, 27°55'N, 107°49'W [27.91667°N, 107.81667°W], 29 Apr 1985, 2330 m, Soreng & Spellenberg 2615 (NMC, US); Rancho Blanco, 30 km N of San Juanito towards La Junta, 28.2°N, 107.6°W, 19 mi N of San Juanito towards La Junta, 29 Apr 1985, 2090 m, Soreng & Spellenberg 2620, 2623 (NMC); Sierra Las Manzanas, 2 km SW of Tosanachic on road to Agua Caliente, ca. 53 km due W of Ciudad Guerrero, 28.30°N, 108°05'W [28.5°N, 108.08333°W], 1950 m, 13 Apr 1984, Soreng & Spellenberg 2305 (NMC, US). **Guachochi:** Creel, 5 km S of



town, 27°43'N, 107°45'W [27.71667°N, 107.75°W], 15 Apr 1984, 2380 m, *Soreng & Spellenberg* 2309 (NMC); S of San Ignacio Arareco, south of airstrip, SE of Creel, 27.7°N, 107.7°W, 20 Jul 1972, 2255 m, *Bye* 2404 (MEXU); along Rio Oteros, west of Creel, *Bye* 3673 (MEXU); Tomachic, 6.7 mi E and 5 mi W of Cieneguita, on road to Cuauhtemoc, 30 km SW of Ciudad Guerrero, 28°20'N, 107°43'W [28.33333°N, 107.71667°W], 7400 ft [2255 m], 14 Apr 1984, *Soreng & Spellenberg* 2307 (NMC, US). **Guerrero:** Waldungen [groves] der Sierra Madre Occidental, umgebung [surroundings] von Sierra Colorada, 4 Apr 1906, *R. Endlich* 1209 (US); Miñaca, 107.35°N, 28.45°W, 1 Apr 1908, *J.N. Rose* 11648 (US), holotype. **Ocampo:** Basaseachic, in the barranca [canyon] below the falls, 28°1'N, 108°15'W [28.01667°N, 108.25°W], 27 Apr 1985, 1980 m, *Soreng & Spellenberg* 2606 (NMC); 10 mi SE of Basasiachic on road to San Juanito, 8 mi SE of junction with Yecora–Tomochic road, 2715 m, 28 Apr 1985, *Soreng & Spellenberg* 2609a (US); 3.3 mi S of Chorro de Agua (abandoned sawmill) on road to sawmill El Cuervo, 22 Jun 1987, 1900 m, *T.R. Van Devender, R.K. Van Devender & P.S. Martin s.n.* (ARIZ); 9 mi SE of Yoquivo on Basasiachic–San Juanito road, 28.0311°N, 107.9234°W, 28 Oct 1985, 2410 m, *Soreng & Spellenberg* 2610 (NMC); **Temósachi:** Between Yeporema and Baviacora, 29.2°N, 107.9°W, 2250 m, *Correll & M.I. Johnston* 21626, 21635-A (US).

*Poa fendleriana* subsp. *fendleriana*

**DISTRIBUTION AND HABITAT.** The subspecies is found throughout the range of the species. In Mexico the subspecies is found in Bajo California, Chihuahua, Coahuila, and Sonora (Soreng and Peterson 2012).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ascensión:** Canyon in N face of Sierra Rica, S of Rancho La Consolación, 3 May 1973, Matorral [scrub], 1400–2000 m, *M.C. Johnston, T.L. Wendt & F. Chiang* 10777 (MEXU). **Bocoyana:** On N-facing slope along Río Oteros, W of Creel, 6 May 1973, pine–oak forest, *Bye* 3675 (MEXU). **Guerrero:** Barranca del Cobre, SE of Creel 28 mi, N of Rio Urique crossing, 2135 m, 14 Apr 1984, *Soreng* 2312 & *R.W. Spellenberg* (US); N of Basuchil, ca. 10 mi NW of Miñaca, arid grassland, 2200 m, 8 May 1929, *Y. Mexia* 2511 (CAS, MO). Tomachic, 4.2 mi E on road from La Junta to Yecora, 2135 m, 13 Apr 1984, *Soreng* 2306 & *Spellenberg* (US).

321. *Poa matri-occidentalis* subsp. *mohinorensis* Soreng & P. M. Peterson, *Sida* 22(2): 211. 2006.

FIGURE 207

Perennial; tufted, sub-rhizomatous. Culms 45–80 cm tall, erect or slightly decumbent, leafy, terete or weakly compressed, smooth. Sheaths compressed, distinctly keeled with a short wing to 0.5 mm deep, smooth, glabrous, margins fused 66%–80% the length; collars smooth or lightly scabrous or ciliate; ligules 3.5–6 mm long, scarious-white to hyaline, apex obtuse to acute, entire; blades mostly 10–30 cm long, 2–6 mm wide, flat, to broad-V

shaped, thin, lax, abaxial surface and margins lightly scabrous along the veins, adaxially smooth, glabrous, apex narrowly prow-tipped; mid-cauline blades 20–30 cm long; flag leaf blades 12–22 cm long. Panicles 12–26 cm long, nodding, open, pyramidal, sparse, with 24–85 spikelets; rachis with (1)2(3) branches per node; primary branches ascending to spreading, slender, flexuous, lax, angled, angles sparsely to moderately scabrous; lateral pedicels as long as spikelets, scabrous; longest branches 5.5–10 cm long, with 3–15 spikelets in the distal 1/3–1/2. Spikelets 4–8 mm long, 1.8–2.7 mm wide, broadly lanceolate, laterally compressed, not bulbiferous, greenish to stramineous; florets 2–3, bisexual; rachilla internodes terete, 1–2 mm long, usually hidden, smooth, glabrous; glumes lanceolate, sub-lustrous, equal to subequal, distinctly keeled, keels scabrous distally, edges smooth or lightly scabrous, apex narrowly acute; lower glumes 3–5 mm long, (1)3-veined, narrowly lanceolate; upper glumes 3.7–5.6 mm long, distinctly 3-veined, lanceolate to oblanceolate; calluses dorsally webbed, the hairs 2–3 mm long, woolly; lemmas 4.6–6.3 mm long, lanceolate, 5-veined, green, distinctly keeled, keel and marginal veins glabrous, sparsely puberulent or scabrous, upper margins narrowly scarious-hyaline, apex acute, sometimes briefly purple and bronze tinged; paleas 4.4–6 mm long, usually distinctly shorter than the lemma, keels long scabrous between keels. Flowers chasmogamous; lodicules (0.3)0.6–0.8 mm long, broadly lanceolate to ovate, with a lateral lobe; anthers 2–2.2 mm long, infrequently those of distal flower abortive. Caryopsis 2.6–3 mm long, fusiform in side view, laterally compressed, light brown to olivaceous, grain adherent to the palea.

**DISTRIBUTION AND HABITAT.** *Poa matri-occidentalis* P. M. Peterson & Soreng is found on moist rocky ledges and cliffs associated with *Juniperus*, *Pinus*, *Abies*, and *Picea* at 2,950–3,300m. It flowers from August to October. *Poa matri-occidentalis* has two subspecies; *P. matri-occidentalis* subsp. *mohinorensis* is endemic to Chihuahua.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guadalupe y Calvo:** Sierra Mohinora, near Cumbre Mohinora, 3250–3300 m, 13 Sep 2006, *P.M. Peterson* 20048, 20049, *F. Sánchez Alvarado & E.P. Gómez Ruíz* (US); 16–17 Oct 1959, *D.S. Correll* 23177 & *H.S. Gentry* (LL); Cerro Mohinora, the northern side of the hill, 2 Nov 2007, pine forest, 3090 m, *D. Stancik & S. Gonzalez* 6187 (MEXU); N side of Cerro Mohinora, Ca. 13 mi SW of Guadalupe y Calvo, 20 Aug 1988, 3200 m, *G.L. Nesom & J.A. McDonald s.n.* (ARIZ).

322. *Poa pratensis* L., *Sp. Pl.* 1: 67–68. 1753.

FIGURE 208

Perennial; green or anthocyanic, sometimes glaucous; extensively rhizomatous, densely to loosely tufted or the shoots solitary. Culms 5–70(100) cm long, erect or the bases decumbent, nodes terete or weakly compressed, 1–2(3) exposed. Sheaths closed for 1/4–1/2 their length, terete to slightly compressed, glabrous or sparsely to moderately hairy, glabrous, not swollen; collars smooth, glabrous; ligules 0.9–2(3.1) mm long, smooth

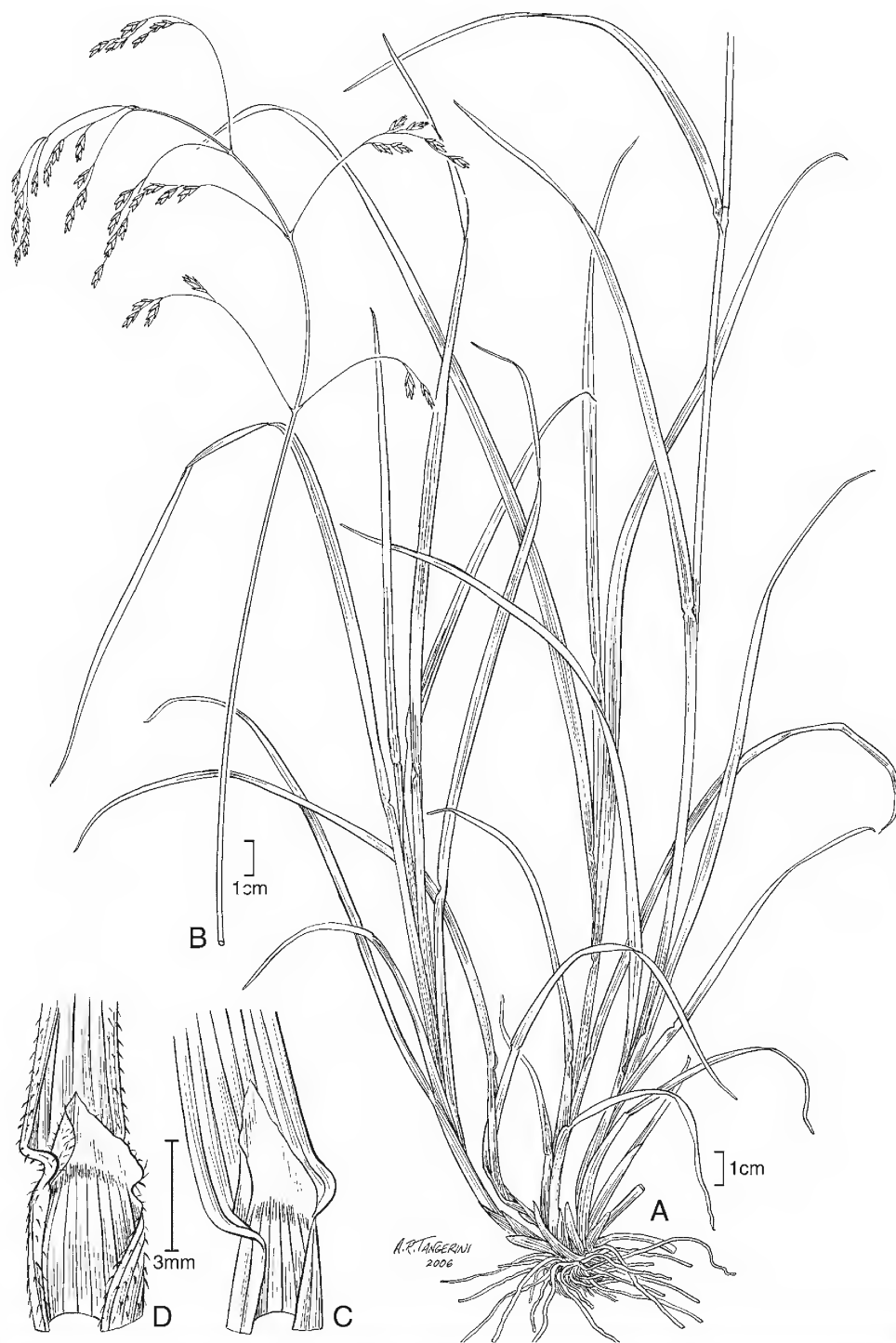


FIGURE 207. *Poa matri-occidentalis*. A. Habit. B. Culm and inflorescence. C. Ligule. *Poa matri-occidentalis* subsp. *mohinorensis*. D. Ligule. Drawn by Alice R. Tangerini for Smithsonian Institution, Department of Botany.

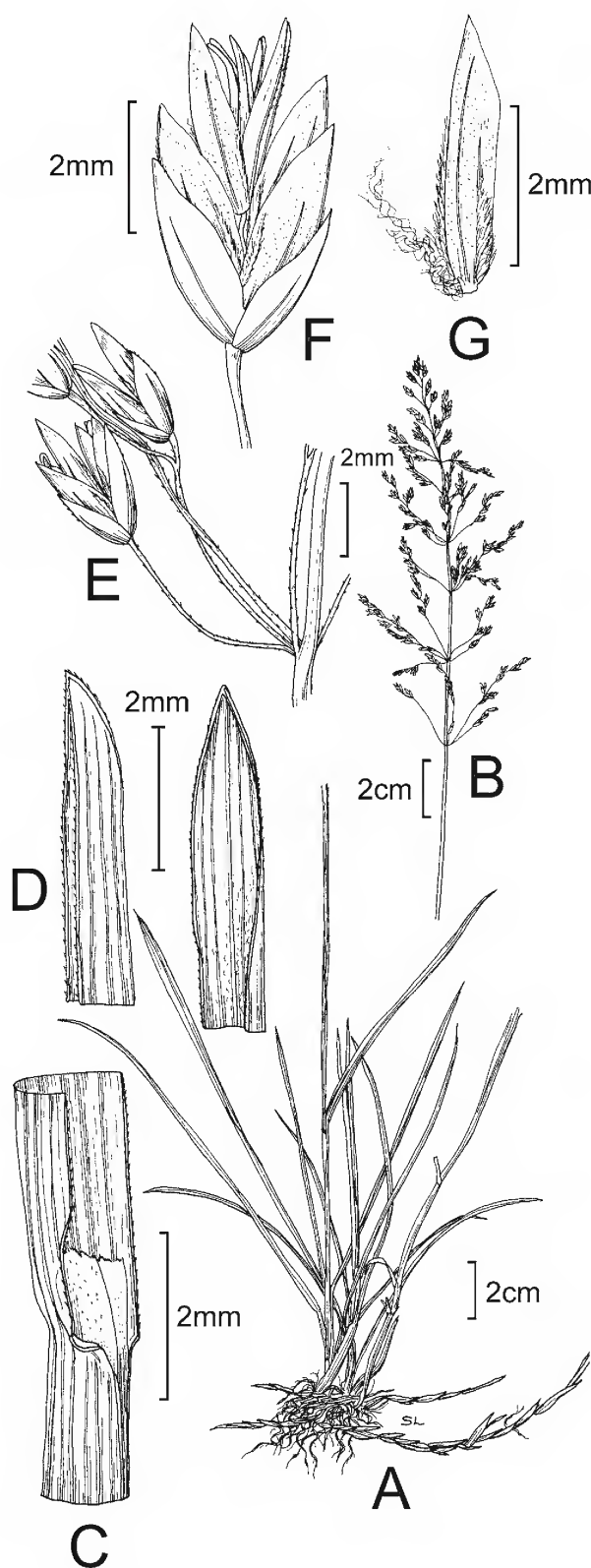


FIGURE 208. *Poa pratensis*. A. Habit. B. Inflorescence. C. Ligule. D. Leaf blade apex. E. Portion of the inflorescence. F. Spikelet. G. Lemma. Drawn by Sandy Long; copyright Utah State University.

or scabrous, truncate to rounded, ciliolate or glabrous; blades of extravaginal innovations like those of the culms, those of the intravaginal shoots sometimes distinctly narrower, 0.4–1 mm wide, flat to involute; cauline blades 0.4–4.5 mm wide, flat, folded, or involute, soft and lax to moderately firm, smooth, glabrous or sparsely scabrous, frequently sparsely hairy, the hairs 0.2–0.8 mm long, erect to appressed, slender, curving, sinuous or straight, apex usually broadly prow-shaped, blades subequal; middle blades longest; flag leaf blades 1.5–10 cm long. Panicles 2–15(20) cm long, narrowly ovoid to narrowly or broadly pyramidal, loosely contracted to open, sparse to moderately congested, with (25)30–100+ spikelets and (1)2–7(9) branches per node; branches (1)2–9 cm long, spreading early or late, terete or angled, smooth or sparsely to moderately densely scabrous, with 4–30(50) spikelets usually fairly crowded in the distal ½. Spikelets 3.5–6(7) mm long, lengths 3.5 times widths, laterally compressed, sometimes bulbiferous; florets 2–5, usually normal, sometimes bulb-forming; rachilla internodes usually shorter than 1 mm long, smooth, glabrous; glumes unequal to subequal, usually distinctly shorter than the adjacent lemmas, narrowly lanceolate to lanceolate, infrequently broadly lanceolate, distinctly keeled, keels usually sparsely to densely scabrous, infrequently smooth; lower glumes 1.5–4(4.5) mm long, usually narrowly lanceolate to lanceolate, occasionally sickle-shaped, 1- to 3-veined; upper glumes 2–4.5(5) mm long, distinctly shorter than to nearly equaling the lowest lemmas; calluses dorsally webbed, sometimes with additional webs below the marginal veins, hairs at least ½ as long as the lemmas, crimped; lemmas 2–4.3(6) mm long, lanceolate, green or strongly purple-tinged, distinctly keeled, keels and marginal veins long-villous, lateral veins usually glabrous, infrequently short-villous to softly puberulent, lateral veins prominent, intercostal regions glabrous, lower portion smooth or finely muriculate, upper portion smooth or sparsely scabrous, margins narrowly to broadly hyaline, glabrous, apex acute; paleas scabrous, keels sometimes softly puberulent, intercostal regions narrow, usually glabrous, rarely sparsely hirsute; anthers usually 1.2–2 mm long, infrequently aborted late in development.  $2n = 27, 28, 32, 35, 37, 41-46, 48-147$ .

**DISTRIBUTION AND HABITAT.** *Poa pratensis* is uncommon in our area but widespread and well established in North America. Soreng and Peterson (2012) separate it into five subspecies, and the only one present in Chihuahua is *Poa pratensis* subsp. *pratensis*.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Balleza: Camino Balleza–Guachochic, km 45, 24 Sep 1981, pastizal amacollado arborescente [grassy pasture], R. Fierro & M.E.

*Siqueiros 1585* (MEXU). **Madera:** Rancho de la Ciénega ejido el Largo, 24 Jun 1990, bosque de pino [pine forest], 2240 m, A. Benítez 1401 (MEXU).

323. *Poa strictiramea* Hitchc., Contr. U.S. Natl. Herb. 17(3): 375. 1913.

FIGURE 209

Perennial; densely tufted, not stoloniferous, not rhizomatous; basal branching intravaginal. Culms 30–90 cm tall, slender to coarse. Sheaths closed for  $\frac{1}{20}$ – $\frac{1}{10}$  their length, terete, scabrous, glabrous; collars smooth to scabrous; ligules 0.5–4(6) mm long, scabrous, apex truncate to acute, entire or lacerate; innovation blades 15–30 cm; cauline blades 1–4 mm wide, involute or rarely flat, moderately thick and firm, both surfaces sparsely to densely antrorsely scabrous, apex narrowly prow-shaped; flag leaf blades usually longer than their sheaths. Panicles (7)10–30 cm long, erect, pyramidal, open, with 2–5 branches per node; branches 2–8(15) cm long, spreading, straight, angled, moderately to densely scabrous, sometimes densely scabrous all over, with 10–30 spikelets. Spikelets 4–7 mm long, lanceolate, laterally compressed; florets 2–5; rachilla internodes 0.8–1.5 mm long, smooth or scabrous, sometimes sparsely hirsute; glumes sparsely to rarely densely scabrous; lower glumes 1- to 3-veined; calluses usually glabrous, rarely sparsely short-webbed; lemmas 2.5–3.5 mm long, lanceolate, distinctly keeled, smooth or sparsely to densely scabrous, keels and marginal veins glabrous or softly puberulent or short to long villous, lateral veins moderately prominent to prominent, intercostal regions usually glabrous, infrequently sparsely softly puberulent, apex acute; palea keels scabrous; anthers 2.2–2.5 mm long or aborted late in development.  $2n = 28 + I, 28-29 + II$ .

**DISTRIBUTION AND HABITAT.** *Poa strictiramea* grows on shady, upland mountain slopes, usually below north facing cliffs. It ranges from the United States to Mexico in and around the Chihuahuan Desert in Chihuahua, Coahuila, Durango, and Nuevo León.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** On slopes above Río Oteros W of Creel, 16 Oct 1977, 2200 m, Bye & W.A. Weber 8242 (MEXU). **Cusihuiriachic:** Montaña La Bufo, arriba [above] de Cusihuiriachic, 2 Sep 1887, C.G. Pringle 1437 (MEXU, US), type. **Guachochi:** Cusihuiriachic, N-facing slopes below La Bufo, 14 Apr 1984, 2350 m, Soreng & Spellenberg 2308 (NMC). **Madera:** San Jose de Babi-cora, 3 km W of Pina Blanca on road to Madera, El Diablo Pass, 13 Apr 1984, 2250 m, Soreng & Spellenberg 2304 (NMC); 1.5 km al NE de Col. Chihuichupa, 4 May 1992, bosque de pino [pine forest], 2240 m, E. Guízar 2663 (CIIDIR, MEXU).

### *Polypogon* Desf.

Annual or perennial; not rhizomatous. Culms 4–120 cm tall, erect to decumbent, rooting at the lower nodes, sparingly branched near the base. Leaves usually no more than 5 per culm, basal and cauline; sheaths open, smooth or scaberulous;

auricles absent; ligules membranous or hyaline, acute to broadly rounded, erose, ciliate; blades flat to convolute. Inflorescence a terminal panicle, dense, continuous or interrupted below; branches flexible, usually some longer than 1 cm; pedicels absent

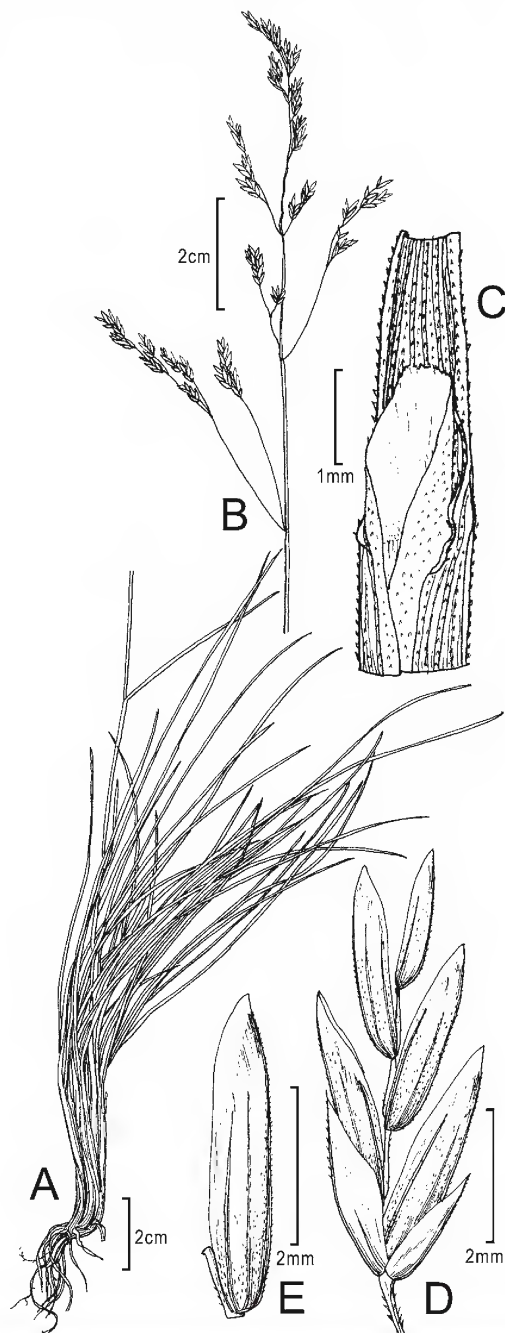


FIGURE 209. *Poa strictiramea*. A. Habit. B. Inflorescence. C. Ligule. D. Spikelet. E. Floret. Drawn by Sandy Long; copyright Utah State University.

and the spikelets borne on a stipe, or present and terminating in a stipe; stipes scabrous, flaring distally; disarticulation at the base of the stipes. Spikelets 1–5 mm long, weakly laterally compressed, with 1 bisexual floret; rachillas not prolonged beyond the base of the floret; glumes exceeding the floret, lanceolate, bases not fused, apex entire to emarginate or bilobed, usually awned from the sinuses or apex, awns flexuous, glabrous, sometimes unawned; lemmas 1- to 3(5)-veined, often awned,

awns usually terminal or subterminal, sometimes arising from just above midlength; paleas from  $\frac{1}{3}$  as long as to equaling the lemmas; lodicules 2, oblong-lanceolate to lanceolate; anthers 3; ovaries glabrous; styles separate. Caryopsis slightly flattened, broadly ellipsoid to oblong-ellipsoid; hila  $\frac{1}{6}$ – $\frac{1}{4}$  as long as the caryopsis, ovate.  $x = 7$ .

*Polypogon* is a pantropical and warm-temperate genus of about 14 species (Soreng et al., 2017b).

#### KEY TO SPECIES OF POLYPOGON

1. Inflorescence spiciform, very compact; spikelets awned, annual plants ..... *P. monspeliensis*
1. Inflorescence a spread panicle, ellipsoid or pyramidal, often interrupted on the base; spikelets awned or awnless; perennial plants.
  2. Spikelets awnless; panicles 3.5–8.5 cm long ..... *P. viridis*
  2. Spikelets prominent awned; panicles 10–30 cm long ..... *P. elongatus*

324. *Polypogon elongatus* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 134–135. 1815.

FIGURE 210

Perennial; often flowering the first year. Culms to 100 cm tall, erect or decumbent at the base. Sheaths smooth, glabrous; ligules 4–8 mm long, scaberulous, lacerate; blades 10–30 cm long, 4–15 mm wide. Panicles 10–30 cm long, erect or nodding, interrupted, dense; pedicels not developed; stipes 1.5–2.5 mm long; glumes 3–5 mm long, hirsute, tapering from about midlength to the acute apex, apex unlobed, awned, the awns 1–3 mm long; lemmas about 1.5 mm long, awned, the awns 1–2 mm long, arising from above midlength; paleas  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the lemmas; anthers 0.5–0.7 mm long.  $2n = 28, 56$ .

**DISTRIBUTION AND HABITAT.** *Polypogon elongatus* is native from Mexico to Argentina. It has two varieties: *Polypogon elongatus* var. *elongatus*, which is widely distributed, and *P. elongatus* var. *strictus* E. Desv. from southern Chile (Finot et al., 2013).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cañada de Recogoata, 23 Sep 1997, bosque de pino-encino [pine-oak forest], 1900 m, *B. Tab V. 60-A* (MEXU). **Camargo:** 5 km W of cd. Camargo, 5 Aug 1939, *L. H. Harvey 1408* (US). **Chihuahua:** Presa de Chihuahua, 1 Aug 1936, *LeSueur 0150* (MEXU, US). **Guachochi:** 1–2 km S of Río Osichi Canyon and Río Basihuare jct, 1 Sep 2003, bosque de *Quercus-Pinus*, 1600 m, *P.M. Peterson & P. Catalán 17633* (CIIDIR, US); Rejogochic, north of Humira, north of Barranca del Cobre, 1 Nov 1993, grass in sand along arroyo, ca. 6000 ft, *Bye 5726* (MEXU). **Madera:** Arroyo La Quinta, ejido El Largo, 13 Oct 1990, bosque mixto [mixed forest] de *Pinus-Quercus-Pseudotsuga*, 2100 m, *O. Bravo 1880* (CIIDIR, MEXU); Ciénega del Pitorreal ruta mesa del huracán [hurricane route] al Hierbanís, 23 Jun 1990, bosque de *Pinus-Quercus spp* con *Platanus* & *Arbutus*, 2200 m, *O. Bravo 820* (MEXU). **Ocampo:** Parque Nacional “Cascada de Basaseachi” in the barranca [canyon] at the base of the falls, 11 Nov 1989, bosque de encino-Abies, 1570 m, *Spellenberg,*

*R. Corral D. T. Lebgue & M. Mahrt 10062* (CIIDIR, MEXU); Parque Nacional “Cascada de Basaseachic,” in the barranca at the base of the falls, 11 Nov 1989, 1700 m, *Spellenberg, R. Corral, T. Lebgue & M. Mahrt 10062* (NMC); Parque Nacional “Cascada de Basaseachic,” 25 Abr [Apr] 1986, 1700 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8478* (NMC).

325. *Polypogon monspeliensis*\* (L.) Desf., Fl. Atlant. 1: 67. 1798. *Alopecurus monspeliensis* L., Sp. Pl. 1: 61. 1753.

FIGURE 211

Annual. Culms 5–65 (100) cm tall, erect to geniculately ascending. Sheaths glabrous, the uppermost sheaths sometimes inflated; ligules 2.5–16 mm long; blades 1–20 cm long, 1–7 mm wide. Panicles 1–17 cm long, narrowly ellipsoid, dense, sometimes lobed, greenish; pedicels absent or to 0.2 mm long; stipes 0.1–0.2 mm long; glumes 1–2.7 mm long, hirsute throughout, the largest prickles restricted to the lower  $\frac{1}{2}$ , apex rounded, lobed, lobes 0.1–0.2 mm long,  $\frac{1}{10}$  or less the length of the glume body, awned from the sinus, the awns 4–10 mm long, yellowish; lemmas 0.5–1.5 mm long, glabrous, awned, the awns 0.5–1(4.5) mm long; paleas subequal to the lemmas; anthers 0.2–1 mm long.  $2n = 14, 28, 35, 42$ .

**DISTRIBUTION AND HABITAT.** *Polypogon monspeliensis* is native to southern Europe and Turkey. It is now a common weed throughout the world, including much of Mexico. It grows in damp to wet, often alkaline soils, particularly in disturbed areas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Camargo:** 5 km W of cd. Camargo, 5 Aug 1939, *L. H. Harvey 1405* (US). **Chihuahua:** Rancho Experimental la Campana, 7 Jul 77, Lotes de producción forrajera [forage-production lots], 1540 m, *S. González 835* (RELC). **Jiménez:** 2 km W of Cd. Jiménez, 28 Jul 1939, *L. H. Harvey 1317* (US). **Juárez:** Ciudad Juárez a lo largo [along] de la “Asequia Madre” al N del fracc. Rincones de San Marcos, 13 Oct 1995, 1140 m, *R. Corral, P. Olivás & L.M. Barraza RCD6533* (UACJ).



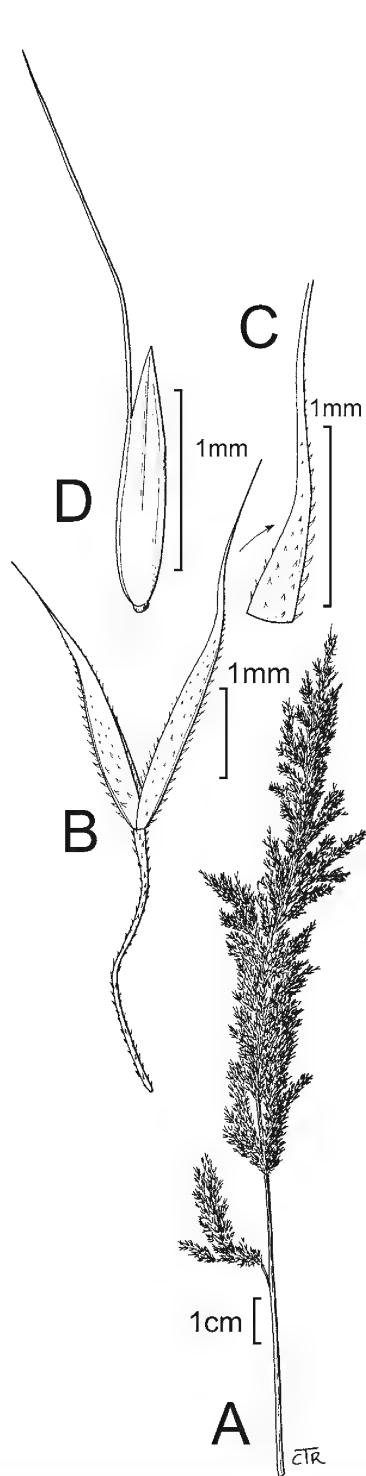


FIGURE 210. *Polypogon elongatus*. A. Inflorescence. B. Glumes. C. Apex of glume. D. Floret. Drawn by Cindy Roché; copyright Utah State University.

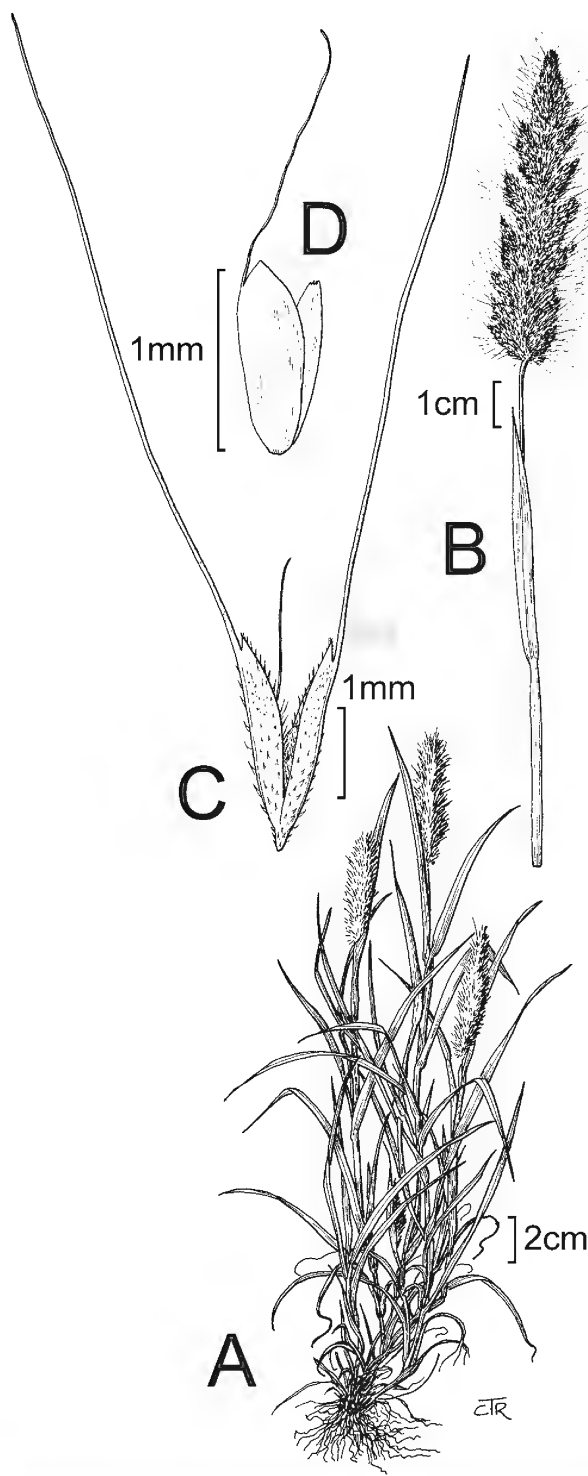


FIGURE 211. *Polypogon monspeliensis*. A. Habit. B. Culm and inflorescence. C. Spikelet. D. Floret. Drawn by Cindy Roché; copyright Utah State University.

326. *Polypogon viridis*\* (Gouan) Breistr., Bull. Soc. Bot. France 110 (89): 56. 1963. *Agrostis viridis* Gouan, Hortus Monsp. 546. 1762.

*Agrostis semiverticillata* (Forssk.) C. Chr.

FIGURE 212

Perennial; often flowering the first year. Culms 10–90 cm long, sometimes decumbent and rooting at the lower nodes. Sheaths glabrous, smooth; ligules to 5 mm long; blades 2–13 cm long, 1–6 mm wide. Panicles 2–10 cm long, ovate-oblong to pyramidal, dense but interrupted, pale green to purplish; pedicels not developed; stipes 0.1–0.6 mm long; glumes 1.5–2 mm long, scabrous on the back and keel, apex obtuse or truncate, unawned; lemmas about 1 mm long, erose, unawned; paleas subequal to the lemmas; anthers 0.3–0.5 mm long.  $2n = 28, 42$ .

**DISTRIBUTION AND HABITAT.** *Polypogon viridis* grows in mesic habitats associated with rivers, streams, and irrigation ditches. It is native from southern Europe to Pakistan but is now established in America, particularly the southwestern United States and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** Cañada de Recogoata, 23 Sep 1997, bosque de pino-encino en cañada [pine-oak forest in glen], 1900 m, *B. Tab V. 60, 67* (MEXU). **Chihuahua:** Cerca [near] del Río, 28 May 1888, *C.G. Pringle s/n* (MEXU); vicinity of Chihuahua, 27 Apr 1908, *E. Palmer 160, 29* (US); El Cima, 29 Jun 1936, *LeSueur Mex 0104* (US); La Campana: 4 km. Ote. [W] carr. [hwy] Panamericana, 6 Sep 73, Maleza en lotes de producción de semilla [meadow in seed-production lots], 1500 m, *Valdés-Reyna VR-99* (RELC). Rancho Experimental La Campana, 7 May 77, lugares húmedos [humid places], 1540 m, *S. González 834* (RELC). **Gran Morelos:** km 21 carr. Chihuahua–Namiquipa (via corta [short]), 24 Sep 1997, bosque de encino oak forest], 1830 m, *M.A. Vergara 189* (MEXU). **Guachochic:** Along trail to Agua Caliente de Cusarare a medicinal hot springs along rio Cusarares, 18 Nov 1973, 1900 m, *Bye 5888* (MEXU). **Guadalupe:** Sierra San Martín de Boracho, Rancho Carrizozo on the N side, 15 Jun 1973, matorral desértico inerme [thornless desert scrub], 1500–2195 m, *M.C. Johnston, T.L. Wendt & F. Chiang 11344* (MEXU). **Jiménez:** 2 km W of Cd. Jiménez, 28 Jul 1939, *L. H. Harvey 1315* (US). **Temosachi:** Temosachi, 23 May 1987, 1800 m, *Laferr. 494* (MEXU).

### *Schismus* P. Beauv.

Annual or short-lived perennials; tufted. Culms sometimes decumbent, glabrous. Sheaths open, usually shorter than the internodes, with tufts of hairs on the margins of the collars; auricles absent; ligules membranous, ciliate; blades flat or folded, becoming involute on drying. Inflorescence a terminal, dense panicle, branches 1 or 2 per node; disarticulation initially above the glumes, glumes and pedicels sometimes falling together later. Spikelets with (4)5–7(10) florets; glumes subequal, exceeding or exceeded by the distal floret, 3- to 7-veined, margins hyaline; lemmas 7- to

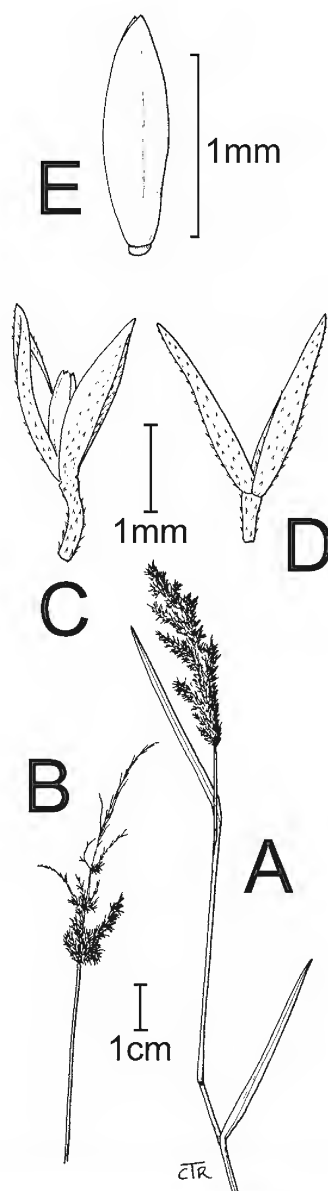


FIGURE 212. *Polypogon viridis*. A. Culm and inflorescence. B. Inflorescence. C. Spikelet. D. Glumes. E. Floret. Drawn by Cindy Roché; copyright Utah State University.

9-veined, margins and intercostal regions usually pubescent, varying to glabrous, margins hyaline, apex bifid or merely notched, sinuses sometimes mucronate; paleas spatulate, membranous, 2-veined, 2-keeled; anthers 3. Caryopsis ovoid.  $x = 6$ .

*Schismus* is a genus of five species that is native to Africa and Asia. Two species are established in North America.

KEY TO SPECIES OF *SCHISMUS*

1. Lower glumes exceeded by the distal florets; lemmas 1.8–2 mm long, rounded and emarginate; palea rounded, as long as the lemma ..... *S. barbatus*
1. Lower glumes equaling or exceeding the distal florets; lemmas 2.5–3 mm long, the apex with 2 acute and hyaline lobes; palea acute, shorter than the lemma ..... *S. arabicus*

327. *Schismus arabicus*\* Nees, Fl. Afr. Austral. Ill. 422. 1841.

Annual. Culms (2)6–16 cm tall. Ligules 0.5–1.5 mm long, of hairs; blades 4–6 cm long, 0.5–2 mm wide, abaxial surfaces glabrous or sparsely pubescent, adaxial surfaces sparsely to densely pubescent. Panicles (1)2–3.5 cm long. Spikelets 5–7 mm long; lower glumes 4.2–6.2 mm long, equaling or exceeding the distal florets; upper glumes 4–6 mm long; lemmas 1.8–2.6 mm long, with dense, spreading pubescence between the veins, lobes longer than wide, acute to acuminate; paleas 1.5–2.2 mm long, shorter than the lemmas; anthers 0.2–0.5 mm long. Caryopsis 0.5–0.8 mm long,  $2n = 12$ .

**DISTRIBUTION AND HABITAT.** *Schismus arabicus* is native to southwestern Asia and is established in the southwestern United States to northwestern Mexico (Baja California, Chihuahua, and Sonora), growing in open and disturbed sites (Dávila et al., 2006).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Juárez: por la carr. [hwy] Méx 2, en los alrededores [surroundings] de San Agustín, 29 km al SE de Cd. Juárez, 18 Mar 1995, en suelos arenosos [sandy soil], 1120 m, R. Corral, P. Olivas & E. Pérez RCD6065 (UACJ).

328. *Schismus barbatus*\* (Loefl. ex L.) Thell., Bull. Herb. Boissier, sér. 2. 7(5): 391. 1907. *Festuca barbata* Loefl. ex L., Demonstr. Pl. 3. 1753.

Annual. Culms 6–27 cm tall. Ligules 0.3–1.1 mm long, of hairs; blades 3–15 cm long, 0.3–1.5 mm wide, abaxial surfaces glabrous or scabrous, adaxial surfaces scabrous, sparsely long-pubescent near the ligules. Panicles 1–6(7.5) cm long. Spikelets 4.5–7 mm long; lower glumes 4–5.2 mm long, exceeded by the distal florets; upper glumes 4–5.3 mm long; lemmas 1.5–2(2.5) mm long, with sparse, appressed pubescence between the veins, or glabrous and with spreading hairs on the margins, lobes as wide as or wider than long, acute to obtuse; paleas 1.7–2.2(2.6) mm long, those of the lower florets in the spikelets as long as or longer than the lemmas; anthers 0.2–0.4 mm long. Caryopsis 0.6–0.8 mm long,  $2n = 12$ .

**DISTRIBUTION AND HABITAT.** *Schismus barbatus* is native to Eurasia and is established in the southwestern United States and northwestern Mexico (Baja California, Baja California Sur, Chihuahua, and Sonora), growing in sandy sites and dry riverbeds often along disturbed roadsides and fields (Dávila et al., 2006).

***Schizachyrium* Nees**

Annual or perennial; caespitose or rhizomatous, sometimes both caespitose and short rhizomatous. Culms branched above the bases, often purplish near the nodes. Leaves not aromatic, sheaths open; auricles usually absent; ligules membranous; blades flat, folded, or involute, those of the uppermost leaves often greatly reduced. Inflorescences axillary and terminal, of 1, rarely 2, rames, peduncles subtended by a modified leaf, rames not reflexed, with spikelets in heterogamous sessile-pedicellate spikelet pairs; pedicels free of the rame axes, usually pubescent; internodes more or less flattened, filiform to clavate, without a median groove, apex cupulate or fimbriate; disarticulation in the rame axes, below the sessile spikelets. Spikelets somewhat dorsoventrally compressed. Sessile spikelets with 2 florets; glumes exceeding the florets, lanceolate to linear, membranous; lower glumes enclosing the upper glumes, convex, weakly 2-keeled, with several (sometimes inconspicuous) intercostal veins; lower florets reduced to hyaline lemmas; upper florets bisexual, lemmas hyaline, bilobed or bifid to  $\frac{7}{8}$  of their length (rarely entire), awned from the sinuses; anthers 3; pedicellate spikelets usually shorter than to as long as the sessile spikelets, occasionally longer, sterile or staminate, with 1 floret, often disarticulating as the rame matures; lemmas present in staminate spikelets, hyaline, unawned or with a straight awn.  $x = 10$ .

*Schizachyrium* is a genus of about 64 species that are native to tropical and subtropical regions of the world; 9 are native to North America.

KEY TO SPECIES OF *SCHIZACHYRIUM*

1. Plants annual: culms 5–40(60) cm tall ..... *S. brevifolium*
1. Plants perennial; culms 40–150 cm tall.
  2. Leaf blades 0.5–2 mm wide, with a longitudinal stripe of white, spongy tissue (formed of bulliform cells) on their adaxial surfaces; plants caespitose; pedicellate spikelets about as long as the sessile spikelets ..... *S. tenerum*
  2. Leaf blades (1)1.5–9 mm wide, without a longitudinal stripe of white, spongy tissue on their adaxial surfaces; plants caespitose or rhizomatous; pedicellate spikelets equal to or smaller than the sessile spikelets.
    3. Pedicellate spikelets 6–8 mm long, about as long as the sessile spikelets, usually staminate, sometimes sterile, unawned ..... *S. cirratum*

3. Pedicellate spikelets 0.7–10 mm long, usually shorter than the sessile spikelets, sterile, unawned or awned, the awns up to 6 mm long.
4. Upper lemmas cleft for  $\frac{2}{3}$ – $\frac{7}{8}$  of their length; lower glumes glabrous or pubescent ..... *S. sanguineum*
4. Upper lemmas cleft for up to  $\frac{1}{2}$  of their length; lower glumes glabrous ..... *S. scoparium*

329. *Schizachyrium brevifolium* (Sw.) Nees ex Büse, Pl. Jungh. 3: 359. 1854.

Annual. Culms 5–40(60) cm tall, prostrate, slender. Sheaths shorter than internodes; ligules a ciliate membrane; blades 1–6 cm long, 1–7 mm wide, apex obtuse; inflorescences composed of 1 raceme, the raceme 1–2.5 cm long, terminal and axillary, subtended by a linear spatheole; rachis fragile at the nodes, semiterete, glabrous or ciliate on margins. Spikelets in pairs, 1 bisexual, sessile, 1 sterile, pedicelled, pedicels glabrous or ciliate; sterile spikelets 1–1.5 mm long, rudimentary, lanceolate, dorsally compressed, shorter than bisexual spikelet, deciduous with the bisexual spikelet, glumes chartaceous, 1 glume awned, the awn 3–6 mm long; bisexual spikelets 2–4 mm long, with 2 florets, 1 basal sterile and 1 fertile, lanceolate, laterally compressed, callus pilose; glumes 2–4 mm long, equal, exceeding apex of florets, firmer than fertile lemma; lower glumes lanceolate, coriaceous, 2-keeled, keeled above and frontally, glabrous or pilose; upper glumes lanceolate, membranous, 1-keeled, apex acuminate; sterile floret lemma oblong, hyaline, 2-veined; fertile lemma oblong, hyaline, without keels, apex entire when awnless, or 2-lobed, mostly awned to rarely muticous, lemma awn 7–12 mm long, from a sinus, geniculate with twisted column, column glabrous; palea absent or minute; anthers 3, 0.5–1 mm long.

**DISTRIBUTION AND HABITAT.** *Schizachyrium brevifolium* is native in tropical Africa and Asia and naturalized in America from Mexico to South America. It has been reported in Chihuahua (Espejo Serna et al, 2000).

330. *Schizachyrium cirratum* (Hack.) Wooton & Standl., New Mexico Agric. Exp. Sta. Bull. 81: 30. 1912. *Andropogon cirratus* Hack., Flora 68(7): 119. 1885.

FIGURE 213

Plants caespitose or short rhizomatous. Culms 31–75 cm tall, often decumbent, not rooting or branching at the lower nodes, glabrous, glaucous, sometimes purplish. Ligules 1–2.5 mm long; blades 6–17 cm long, 2–4 mm wide, glabrous, without a longitudinal stripe of white, spongy tissue. Inflorescence rames 4–6 cm long, usually exserted, straight, often somewhat stiff, not flexuous, appearing linear; internodes straight, with a tuft of hairs near the base, elsewhere glabrous or ciliate on the margins. Sessile spikelets 8–10 mm long; calluses 0.3–0.6 mm long, the hairs 0.5–1.2 mm long; glumes glabrous or scabrous; awns 13–24 mm long; pedicels 3.5–5 mm long, 0.2–0.5 mm wide at the base, widening to 0.5–1 mm near apex, straight, with a tuft of hairs at the base, distal  $\frac{1}{2}$  usually ciliate on 1 side, sometimes on both sides; pedicellate spikelets 6–8 mm long, about as long as the sessile spikelets, usually staminate, sometimes sterile, unawned.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Schizachyrium cirratum* grows on rocky slopes, mostly at elevations of 1,600 m or higher; it occurs from southern California to western Texas into Mexico and is found in South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, bosque de encino [oak forest], 1990 m, P.M. Peterson, Annable & Valdés-Reyna 10750 (CIIDIR, US); 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10734 (CIIDIR, US). **Batopilas:** Yamuco, 1 mi E of hwy N of Río Urique crossing towards Basihuare and Creel, 5–6 Sep 2008, P.M. Peterson & J.M. Saarela 22054 (US); SW Chihuahua, Aug 1885, E. Palmer 7-B (US). **Chihuahua:** near Chihuahua, 17 Oct 1885, C.G. Pringle 382 (US); Rancho La Campana, Potrero de La Sierra, 3 km Pte, carr. [hwy] Panamericana, 14 Sep 73, Pastizal con encino [pastureland with oak], 1680 m, Valdés-Reyna VR-283 (RELC). **Cuahtémoc:** 54 mi W of Cd. Chihuahua, 7 Oct 1972, 6100 ft, L. H. Harvey & Witherspoon 9299 (ENCB). **Guachochi:** along Río Corareachi, 30 Aug 2003, slopes with *Quercus*, 1840–1900 m, P.M. Peterson & P. Catalán 17602 (CIIDIR); P.M. Peterson & Catalán 17626 (US); Small spring below Napuchis, 2 Sep 2003, bosque de pino [pine forest], 2162 m, P.M. Peterson & P. Catalán 17665 (CIIDIR, US). **Guadalupe y Calvo:** Río Verde Crossing, 21 mi SW of El Vergel on hwy 24, 14 Sep 2006, 2330–2360 m, P.M. Peterson 20074, F. Sánchez Alvarado & E.P. Gómez Ruíz (CIIDIR, US). **Guerrero:** 38.6 km SW of La Junta and approx. 70.8 km N of Creel at P. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, 2200 m, P.M. Peterson & Annable 5843 (US); 33.7 mi W of La Junta on road to Parque Nacional Cascada Basaseachic, 30 Sep 1989, 2260 m, P.M. Peterson & R.M. King 8219 (US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 27 Aug 1939, 1675 m, L. H. Harvey 1625 (US). **Madera:** Laguna de Babicora, Ejido Año de Hidalgo, 15 Sep 1994, 2300 m, T. Lebgue, G. Quintana & E. Estrada 3768 (NMC); Laguna de Babicora, alrededores [surroundings] de Nicolas Bravo, 18 Aug 1994, 2200 m, Quintana, Lebgue & Estrada 3131 (NMC); 10 Km al N de Madera, 5 Oct 74, bosque de pino–encino, 2000 m, Valdés-Reyna VR-874 (RELC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” a los lados [sides] del arroyo Basaseachic, 21 Sep 1990, 2100 m, R. Corral RCD-3841 (NMC); Parque Nacional “Cascada de Basaseachic,” at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8688 (NMC); Parque Nacional “Cascada de Basaseachic,” in a canyon along Río Basaseachi leading to falls, 4 Oct 1986, 1950 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8824 (NMC); Beside the road near Ocampo. 26 Jul 1990, 2000 m, P. Jenkins 90-290 (ARIZ). **Riva Palacio:** Col. Cumbres de Majalca, 33.8

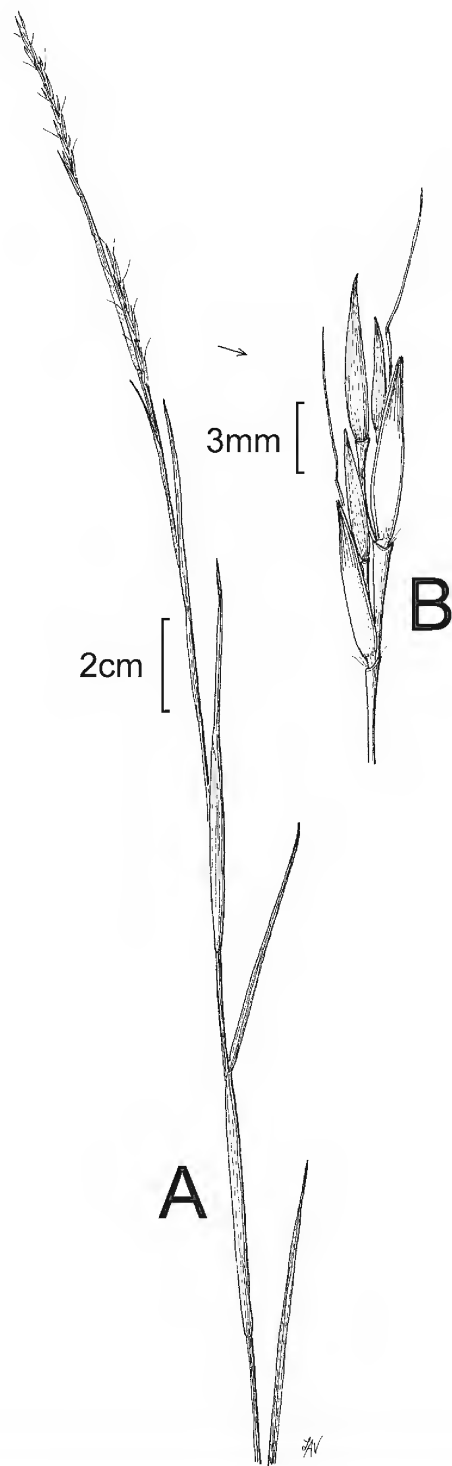


FIGURE 213. *Schizachyrium cirratum*. A. Culm and inflorescence. B. Portion of inflorescence branch. Drawn by Linda Ann Vorobik; copyright Utah State University.

km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, P.M. Peterson, Annable & Y. Herrera 7960, 7965 (US). P.M. Peterson & Annable 5843 (US).

331. *Schizachyrium sanguineum* (Retz.) Alston, Handb. Fl. Ceylon 6: 334. 1931. *Rottboellia sanguinea* Retz., Observ. Bot. 3: 25. 1783.

*Schizachyrium hirtiflorum* Nees, *Schizachyrium semiglabrum* Nash.

FIGURE 214

Plants caespitose. Culms 40–120 cm tall, erect, not rooting or branching at the lower nodes, glabrous. Sheaths glabrous, rounded; ligules 0.7–2 mm long; blades 7–20 cm long, 1–6 mm wide, usually with long, papillose-based hairs basally, glabrous elsewhere, sometimes scabrous, without a longitudinal stripe of white, spongy tissue. Peduncles 4–6 cm long; rames 4–15 cm long, not open, usually almost fully exerted at maturity; internodes 4–6 mm long, straight, from mostly glabrous with a tuft of hairs at the base to densely hirsute all over. Sessile spikelets 5–9 mm; calluses 0.5–1 mm long, the hairs to 2 mm long; lower glumes glabrous or densely pubescent; upper lemmas cleft for  $(\frac{2}{3})\frac{3}{4}$ – $\frac{7}{8}$  of their length; awns 15–25 mm long; pedicels 3–6 mm long, 0.3–0.5 mm wide at the base, gradually widening to about 0.6–0.8 mm at the top, straight; pedicellate spikelets 3–5 mm long, usually evidently shorter than the sessile spikelets, sterile or staminate, awned, the awns 0.3–6 mm long.

**DISTRIBUTION AND HABITAT.** *Schizachyrium sanguineum* extends from the southern United States to Chile, Paraguay, and Uruguay.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Yamuco at 1 km E of Hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino [pine forest], 1891 m, P.M. Peterson & P. Catalán 17550 (US). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22026 (US). **Chinipas:** Sagarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, P.M. Peterson & J.M. Saarela 22128 (US). **Chihuahua:** 80 km al N de Chihuahua hacia cd. Juárez, 11 Oct 1980, pastizal mediano abierto [mostly open grassland], 1550 m, R. Serrato (ENCB); Rocky hills near Chihuahua, 29 Aug 1885, grassland, 1800 m, C.G. Pringle 383 (US) Isotipo; 87 km N Chihuahua 1 km S Arco Iris on Hwy 45, 5 Oct 1986, 1500 m, Spellenberg, Soreng & R. Corral 8902 (NMC); La Campana, Potrero de la Sierrra, 4 km Pte. Carr. [hwy] Panamericana, 15 Oct 76, pastizal con encino [pastureland with oak], 1850 m, J.M. Peña s/n (RELC); Base de la Sierra de La Campana, 80 km al N de Chihuahua, 19 Oct 1974, 1700 m, Rzedowski 32335 (ARIZ). **Guachochi:** small spring below Napuchis, 2 Sep 2003, bosque de pino, 2162 m, P.M. Peterson & P. Catalán 17665b (CIIDIR, US); **Juárez:** Ciudad Juárez, a lo largo [along] de la “Asequia Madre” entre [between] la Av. Américas & Paseo Triunfo de la República, 29 Sep 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6407 (UACJ). **Madera:** Mesa del Yerbais, ejido El Largo, 12 Oct 1990, bosque



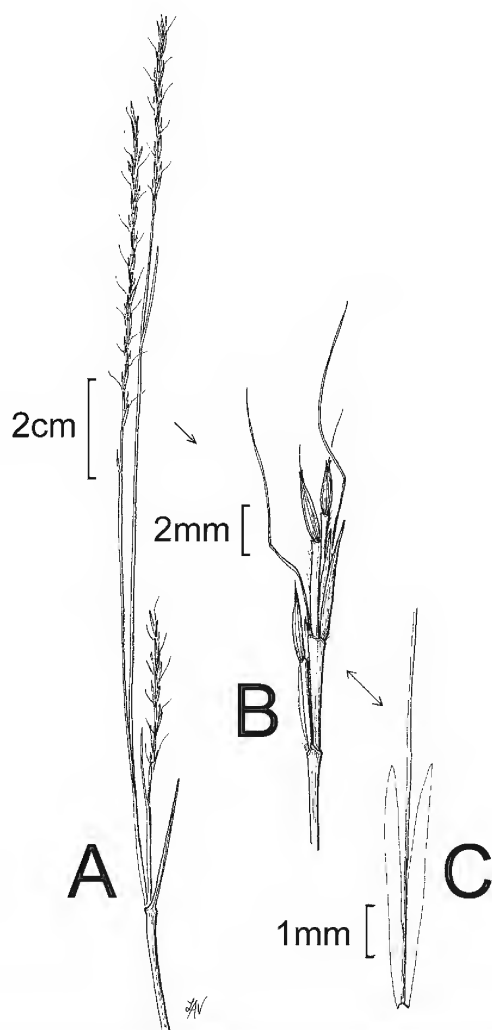


FIGURE 214. *Schizachyrium sanguineum*. A. Culm and inflorescence. B. Portion of inflorescence branch. C. Lemma. Drawn by Linda Ann Vorobik; copyright Utah State University.

de encino, 1900 m, O. Bravo 1843 (CIIDIR); Laguna de Babicora, Arroyo Las Varas, 10 Sep 1994, 2300 m, G. Quintana & E. Estrada 3554 (NMC); 25 km al NE de las Varas, 28 Oct 77, bosque de pino-encino, 2100 m, J.M. Peña JMP-800 (RELC). **Ocampo:** Parque Nacional "Cascada de Basaseachic," on ridge top SE side of canyon of Rio Candamena leading to falls, 4 Oct 1986, 1800 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8710 (NMC). **San Francisco del Oro:** 21 km W of Parral and approx. 3.2 km N on dirt road to Torrencillo, 26 Sep 1988, grassland, 2000 m, P.M. Peterson & Annable 5968 (ENCB, US). **Temosachi:** Nabogame, 11 Sep 1987, oak woodland, 1800 m, Laferr. 1125 (ARIZ).

332. *Schizachyrium scoparium* (Michx.) Nash, Fl. S.E. U.S. 59, 1326. 1903. *Andropogon scoparius* Michx., Fl. Bor.-Amer. 1: 57. 1803.

FIGURE 215

Plants caespitose or rhizomatous, green to purplish, sometimes glaucous. Culms 7–210 cm tall, usually 1–3 mm thick, not rooting or branching at the lower nodes. Sheaths rounded or keeled, glabrous or pubescent, sometimes glaucous; ligules 0.5–2 mm long, collars neither elongate nor narrowed; blades 7–105 cm long, 1.5–9 mm wide, without a longitudinal stripe of white, spongy tissue. Peduncles 0.8–10 cm long; rames 2.5–8 cm long, partially to completely exerted, usually somewhat open; internodes 3–7 mm long, usually arcuate at maturity, ciliate on at least the distal ½ (sometimes throughout), the hairs 1.5–6 mm long. Sessile spikelets 3–11 mm long; calluses 0.5–1(2) mm long, the hairs 0.3–4 mm long; lower glumes glabrous; upper lemmas membranous throughout, cleft to ½ their length; awns 2.5–17 mm long. Pedicels 3–7.5 mm long, 0.1–0.2 mm wide at the base, flaring above midlength to 0.3–0.5 mm long, straight or curving outward. Pedicellate spikelets 0.7–10 mm long, sometimes shorter than the sessile spikelets, sterile or staminate, unawned or awned, awns to 4 mm long, when sterile, the lemma usually absent.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Schizachyrium scoparium* is a widespread grassland species, extending from Canada to central Mexico. It is one of the principal grasses in the tallgrass prairies that used to dominate the central plains of North America. There are three varieties; only *Schizachyrium scoparium* var. *neomexicanum* (Nash) Hitchc. is found in Chihuahua (Espejo Serna et al., 2000).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, P.M. Peterson, Annable & Valdés-Reyna 10732 (CIIDIR, US). **Guachochi:** 39.2 km S of Creel on road to Batopilas at the Barranca El Cobre, 10 Sep 1989, 1930 m, P.M. Peterson, Annable & Y. Herrera 8023 (US). **Gómez Farías:** Laguna de Babicora, 15 km al SO [SW] de San Jose de Babicora, 26 Aug 1994, 2250 m, C. Yen & E. Estrada 3467 (NMC). **Madera:** Laguna de Babicora, Arroyo Las Varas, 10 Sep 1994, 2300 m, G. Quintana & E. Estrada 3552 (NMC).

333. *Schizachyrium tenerum* Nees, Fl. Bras. Enum. Pl. 2: 336. 1829. *Andropogon tener* (Nees) Kunth, Révis. Gramin. 2: 565, t. 197. 1832.

FIGURE 216

Plants caespitose. Culms 60–100 cm tall, sometimes reclining or decumbent, glabrous. Collars not elongate, about as wide as the blade; ligules to 0.5 mm long, ciliolate; blades 5–15 cm long, 0.5–2 mm wide, involute or flat, glabrous or sparsely hairy basally, with a wide central zone of bulliform cells evident on the adaxial surfaces as a longitudinal stripe of white, spongy tissue. Rames 2–6 cm long, eventually long-exserted; internodes 2–4 mm

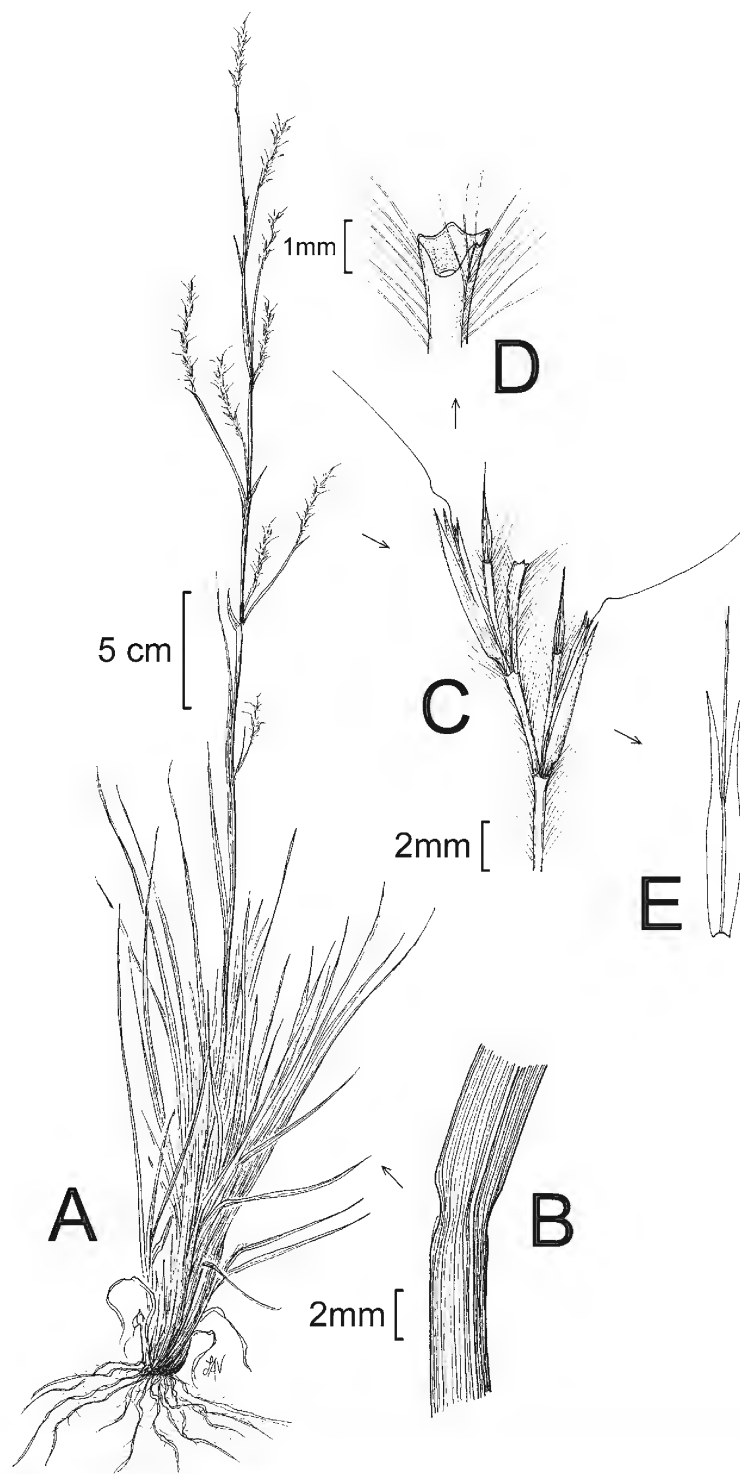


FIGURE 215. *Schizachyrium scoparium* var. *scoparium*. A. Habit. B. Collar. C. Portion of inflorescence branch. D. Distal end of spikelet pair. E. Upper lemma. Drawn by Linda Ann Vorobik; copyright Utah State University.

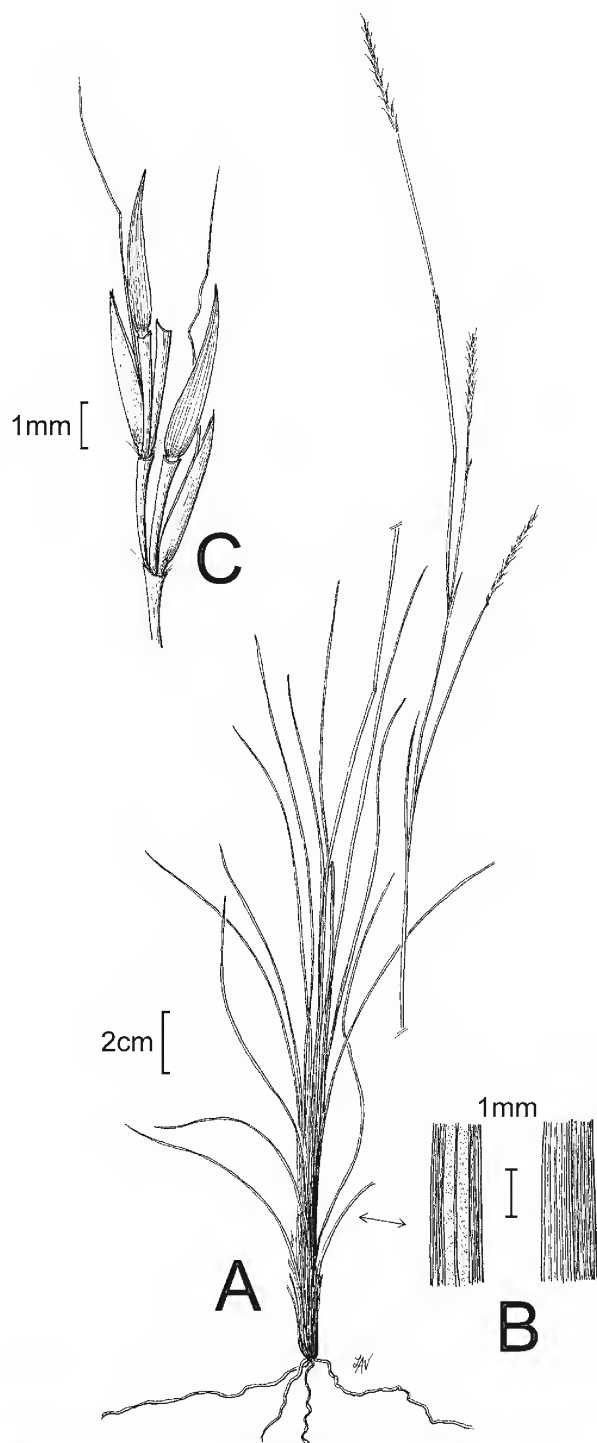


FIGURE 216. *Schizachyrium tenerum*. A. habit. B. Leaf blades, abaxial surface on left, adaxial surface on right. C. Portion of inflorescence branch. Drawn by Linda Ann Vorobik; copyright Utah State University.

long, straight, glabrous. Sessile spikelets 3.5–4.5 mm long; calluses 0.5–1 mm long, the hairs to 1.2 mm long; lower glumes glabrous; upper lemmas acute, entire; awns 6–10 mm long; pedicels 3–5 mm long, glabrous. Pedicellate spikelets usually as long as or slightly longer than the sessile spikelets, sterile, unawned.  $2n = 60$ .

**DISTRIBUTION AND HABITAT.** *Schizachyrium tenerum* is an uncommon species in the southwestern United States, where it grows on sandy soils in pine forest openings and coastal prairies. Its range extends to Central America and into South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** Río Osichi Canyon at jct of Río Basihuare. Up Río Osichi Canyon, 31 Aug 2003, bosque [forest] de *Quercus-Pinus*, 1650 m, P.M. Peterson & P. Catalán 17626 (CIIDIR).

### *Scleropogon* Phil.

Perennial; usually monoecious, less frequently dioecious, occasionally synoecious; bearing wiry, often arching, stolons with 5–15 cm internodes, sometimes also weakly rhizomatous. Leaves mostly basal; sheaths short, strongly veined, basal leaves commonly hirsute or villous; ligules of hairs; blades firm, flat or folded. Inflorescence terminal, usually exceeding the upper leaves, spike-like racemes or contracted panicles with few spikelets, in bisexual plants staminate and pistillate florets in the same spikelet with the staminate florets below the pistillate florets or in separate spikelets, bisexual florets occasionally produced; branches not pectinate; disarticulation above the glumes and below the lowest pistillate floret in a spikelet, florets falling together, lowest floret with a bearded, sharp-pointed callus. Staminate spikelets with 5–10(20) florets; glumes membranous, pale, 1- to 3-veined, acuminate; lemmas 3-veined, similar to the glumes, unawned or awned, awns to 3 mm long; paleas shorter than the lemmas, often conspicuously so. Pistillate spikelets appressed to the branch axes, usually the 3–5 lower florets functional, upper florets reduced to awns; glumes lanceolate, acuminate, strongly 3-veined, membranous, occasionally with a few fine accessory veins; lemmas narrow, 3-veined, veins extending into awns, the awns (30)50–100(150) mm long, spreading or reflexed at maturity.  $x = 10$ .

*Scleropogon* is a monotypic American genus with an amphitropical disjunct distribution (Peterson and Columbus, 1997).

334. *Scleropogon brevifolius* Phil., Anales Univ. Chile 36: 206. 1870.

FIGURE 217

Stolons to 50 cm long, wiry, internodes 5–15 cm. Culms (5)10–20 cm tall, erect. Ligules about 1 mm long; blades 2–8(12) cm long, 1–2 mm wide. Bisexual spikelets 2–4 cm long, staminate florets below the pistillate florets. Staminate spikelets 2–3 cm long. Pistillate spikelets subtended by a glume-like bract; lemma bodies 2.5–3 cm long.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Scleropogon brevifolius* grows on grassy plains and flats, generally being most abundant

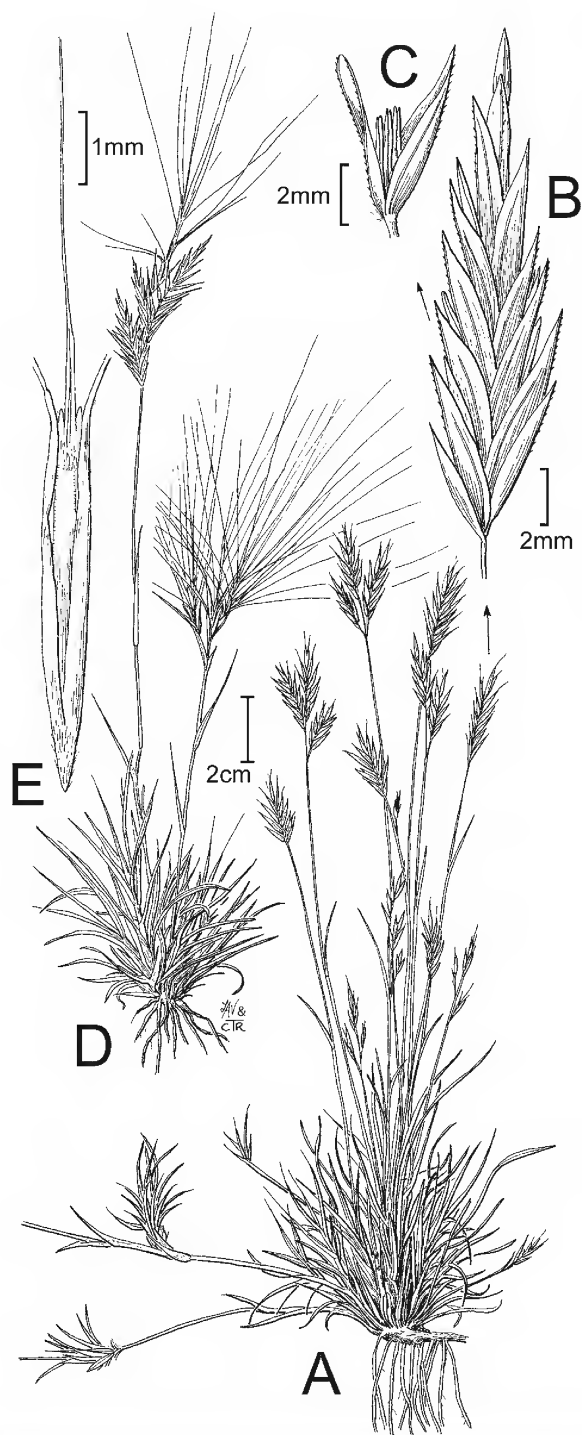


FIGURE 217. *Scleropogon brevifolius*. A. Staminate plant habit. B. Staminate spikelet. C. Staminate floret. D. Bisexual plant habit. E. Pistillate floret. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

on disturbed or overgrazed land. Its North American range extends from the southwestern United States to central Mexico; its South American range is from Chile to northwestern Argentina.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 7 km Pte. Sueco por carr. [hwy] Sueco–Buenaventura, 21 Oct 74, Pastizal [pastureland], 1300 m, *Valdés-Reyna VR-727* (RELC). **Aldama:** 26 (rd) mi NE of Aldama along Hwy 16 near El Morrion, 15 Sep 1972, 1400 m, *J. Henrickson 7560* (NMC); near Chihuahua, 31 Aug 1885, *C.G. Pringle 484* (MEXU-1813, US); 3 km al NNE de San Diego de Alcalá, 10 Oct 1997, 1200 m, *E. Estrada & C. Yen 9003* (NMC); km 35 carr. Chihuahua–Ojinaga, 28 Oct 74, Pastizal halófito [halophyte grassland], 1300 m, *Valdés-Reyna VR-721* (RELC). **Ascensión:** About 10–12 km ENE of Guzmán towards Laguna de Santa María, 22 Aug 1972, 1150 m, *M.C. Johnston, T.L. Wendt & F. Chiang 8791* (MEXU). **Chihuahua:** Near Chihuahua, 31 Aug 1885, 1780 m, *C.G. Pringle 484* (US). **Galeana:** 145 km de Galeana, 8 Aug 1979, pastizal, 1370 m, *M. Siqueiros 303* (MEXU). **Janos:** Rancho El Carrizo, 30 Sep 1982, 1600 m, pastizal mediano abierto [mostly open grassland], *P. Rojas s.n.* (CIIDIR); Salto de Ojo, 13 Oct 1994, pastizal, 1455 m, *M.H. Royo M. s/n* (MEXU); Cerros Prietos, 18 Sep 1977, pastizal, 1400 m, *Blanco & Gómez 20/77* (MEXU). **Jiménez:** About 5 mi SW of Jiménez, 6 Oct 1966, *Reeder & C. Reeder 4607* (ARIZ); 1 km al S of Hacienda El Berrendo on the Las Pampas ranch, 27 Aug 1972, matorral desértico [desert scrub], 1475 m, *F. Chiang, T. Wendt & M.C. Johnston 8878* (MEXU); El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez & M.L. Juárez 3387* (CIIDIR).

### *Setaria* P. Beauv.

Annual or perennial; caespitose, rarely rhizomatous. Culms erect or decumbent. Ligules membranous and ciliate or of hairs; blades flat, folded, or involute, or plicate and petiolate. Inflorescences terminal, panicles, usually dense and spikelike, occasionally loose and open; disarticulation usually below the glumes, spikelets falling intact, bristles persistent. Spikelets usually lanceoloid-ellipsoid, rarely globose, turgid, subsessile to short pedicellate, in involucre on short branches or single on a short branch, some or all subtended by 1 to several, terete bristles (sterile branchlets). Lower glumes membranous, not saccate, less than  $\frac{1}{2}$  as long as the spikelets, 1- to 7-veined; upper glumes membranous to herbaceous at maturity,  $\frac{1}{2}$  as long as to nearly equaling the upper lemmas, 3- to 9-veined; lower florets staminate or sterile; lower lemmas membranous, equaling or rarely exceeding the upper lemmas, rarely absent, not constricted or indurate basally, 5- to 7-veined; lower paleas usually hyaline to membranous at maturity, rarely absent or reduced, veins not keeled; upper florets bisexual; upper lemmas and paleas indurate, transversely rugose, rarely smooth; anthers 3, not penicillate; styles 2, free or fused basally, white or red. Caryopsis small, ellipsoid to subglobose, compressed dorsiventrally.  $x = 9$ .

*Setaria*, a genus of about 113 species, grows predominantly in tropical and warm-temperate regions and is particularly well represented in Africa, Asia, and South America.

KEY TO SPECIES OF *SETARIA*

1. Bristles 4–12 below each spikelet; panicle dense, cylindric
  2. Perennial; rhizomes short and knotty ..... *S. parviflora*
  2. Annual; rhizomes absent ..... *S. pumila*
1. Bristles 1–3 (rarely 6) below each spikelet; panicle open, interrupted, evidently branched.
  3. Bristles retrorsely scabrous; spikelets 1.5–2 mm long, with only 1 bristle, 1 or 2 times longer than the spikelet.
    4. Margins of sheaths ciliate distally; blades scabrous on the abaxial surfaces; panicle branches verticillate ..... *S. verticillata*
    4. Margins of sheaths glabrous; blades strigose on the abaxial surfaces; panicle branches simple or in pairs, not verticillate ..... *S. adhaerens*
  3. Bristles antrorsely scabrous; spikelets 1.8–3.2 mm long, generally with more than 1 bristle, bristles usually twice as long as the spikelets.
    5. Perennial
      6. Spikelets 2.8–3.2 mm long; blades densely villous ..... *S. villosissima*
      6. Spikelets 1.9–2.8(3) mm long; blades not villous.
        7. Lower paleas narrow,  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the lemmas; spikelets elliptical; panicles 6–15 cm long, columnar; blades 2–5(8) mm wide; culms and leaves light green to glaucous ..... *S. leucopila*
        7. Lower paleas broad, subequal to the lemmas in length; spikelets subspherical; panicles 8–30 cm long, dense, cylindrical; blades 7–15 mm wide; culms and leaves green-yellowish ..... *S. macrostachya*
    5. Annual.
      8. Upper glumes and lower lemmas with 7 veins, the outer pair of veins not coalescing with the inner 5; lower paleas absent ..... *S. liebmanni*
      8. Upper glumes and lower lemmas 5- to 7-veined, all of which coalesce near the apex; lower paleas present, sometimes reduced.
        9. Panicles loosely spicate, interrupted; rachises visible, hispid; culm nodes pubescent, hairs appressed ..... *S. grisebachii*
        9. Panicles densely spicate; rachises not visible, villous; culm nodes glabrous ..... *S. viridis*

335. *Setaria adhaerens*\* (Forssk.) Chiov., Nuovo Giorn. Bot. Ital. 26: 77. 1919. *Panicum adhaerens* Forssk., Fl. Aegypt.-Arab. 20. 1775.

Annual. Culms 25–60 cm tall. Sheaths glabrous throughout; ligules 1–2 mm long, of hairs, white; blades usually less than 10 cm long, 5–10 mm wide, flat, broad basally, abaxial surfaces conspicuously strigose with papillose-based hairs, tapering abruptly at the apex; bristles solitary, about 5 mm long, retrorsely scabrous. Panicles 2–6 cm long, verticillate, green to purple; rachises retrorsely rough hispid. Spikelets 1.5–2.2 mm long; lower glumes about  $\frac{1}{2}$  as long as the spikelets, obtuse, 1(3)-veined; upper glumes nearly as long as the spikelets, 5- to 7-veined; lower lemmas equaling to slightly exceeding the upper lemmas; lower paleas less than  $\frac{1}{2}$  as long as the spikelets, scale-like; upper lemmas finely and transversely rugose; upper paleas similar to the upper lemmas.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Setaria adhaerens* grows in subtropical regions throughout the world. In North America, it is known from the southern United States, north-eastern Mexico, Guatemala, Cuba, and the Bahamas (Rominger, 2003). It appears to be introduced and has been reported for Chihuahua (Espejo Serna et al., 2000).

336. *Setaria grisebachii* E. Fourn., Mexic. Pl. 2: 45. 1886.

Annual. Culms 30–100 cm tall; nodes pubescent, the hairs appressed. Sheaths with ciliate margins; ligules ciliate; blades to

12(25) cm long, to 10(20) mm wide, flat, hirsute. Panicles 3–18 cm long, loosely spicate, interrupted, often purple; rachises hispid; bristles 5–15 mm long, 1–3, flexible, antrorsely scabrous. Spikelets 1.5–2.2 mm long; lower glumes about  $\frac{1}{3}$  as long as the spikelets, distinctly 3-veined, lateral veins coalescing with the central veins below the apex; upper glumes nearly equaling the upper lemmas, obtuse, 5-veined; lower lemmas equaling the upper lemmas; lower paleas about  $\frac{1}{3}$  as long as the lower lemmas, narrow; upper lemmas finely and transversely rugose; upper paleas similar to the upper lemmas.

**DISTRIBUTION AND HABITAT.** *Setaria grisebachii* is the most widespread and abundant native annual species of *Setaria* in the southwestern United States. It grows in open ground and extends along the central highlands of Mexico to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** near Chihuahua, 16 Sep 1885, C.G. Pringle 381 (US); 4 Sep 1935, *LeSueur Mex-025* (US); km 14 N of Cd. Chihuahua, 15 Sep 1955, *Hern.-Xol. N-1748* (US); 13 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1585 m, *Soderstrom 910* (US); km 109 carr. [hwy] PanAmer., 28 Oct 76, matorral [scrub], *S. González s/n* (RELC). **Cuauhtémoc:** 21 km W of Cuauhtémoc, on hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable 9592* (US). **General Trías:** km 40 carr. Chihuahua–Cuauhtémoc, 12 Aug 1976, Matorral, 1693 m, *J.M. Peña & S. González 536* (RELC). **Gran Morelos:** km 20 Cd. Cuauhtémoc



de Cd. Chihuahua, 27 Oct 1954, 1500 m, *Hern.-Xol.* N-266 (US). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 26 Aug 1939, *L. H. Harvey* 1596 (US). **Madera:** Paraje Sirupa, ejido Cebollitas, 16 Oct 1990, bosque de encino [oak forest], 1200 m, *O. Bravo* 1922 (CIIDIR). **Riva Palacio:** Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7953 (US).

337. *Setaria leucopila* (Scribn. & Merr.) K. Schum., Just's Bot. Jahresber. 28(1): 417. 1902. *Chaetochloa leucopila* Scribn. & Merr., Bull. Div. Agrostol. U.S.D.A. 21: 26, f. 14. 1900.

FIGURE 218

Caespitose perennial. Culms 20–100 cm tall. Sheaths compressed, glabrous, margins villous distally; ligules 1–2.5 mm long, ciliate; blades 8–25 cm long, 2–5 mm wide, flat or folded, scabrous on both surfaces. Panicles 6–15 cm long, tightly spike-like, pale green; rachises scabrous or villous; bristles 4–15 mm long, usually solitary, ascending. Spikelets 2.1–2.8(3) mm long, elliptical; lower glumes  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the spikelets, 3-veined; upper glumes from  $\frac{3}{4}$  as long as to equaling the florets, 5-veined; lower lemmas equaling the upper lemmas, 5-veined; lower paleas  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the upper paleas, lanceolate; upper lemmas apiculate, finely and transversely rugose; upper paleas similar.  $2n = 54, 68, 72$ .

**DISTRIBUTION AND HABITAT.** *Setaria leucopila* grows in the southwestern United States and northern Mexico. It is the most common of the perennial plains bristle grasses.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5338 (UACJ). **Casas Grandes:** 17 mi S of Nuevo Casas Grandes on Mex 2, 1585 m, *P.M. Peterson & R.M. King* 8144b (US). **Chihuahua:** near Chihuahua, 23 Aug 1885, *C.G. Pringle* 488 (US); 20 Aug 1935, *LeSueur Mex-010* (US); km 14 N of Cd. Chihuahua, 15 Sep 1955, *Hern.-Xol.* N-1758 (US); 3 km al Oeste [west] of Cd. Chihuahua, 9 Aug 1996, pastizal [pastureland], 1500 m, *E. Estrada & C. Yen* 4875 (NMC); La Campana, Potrero La Sierra 1 km Pte. carr. [hwy] PanAmer., 18 Sep 73, pastizal, 1500 m, *Valdés-Reyna VR-310* (RELC). **Jiménez:** 14 mi SE of Jiménez, 3 Sep 1967, *Reeder & C. Reeder* 4839 (ARIZ); El Hugo, Torreoncitos, 13 Aug 2010, matorral [scrub] de *Prosopis* sp., 1355 m, *D. Ramírez & M.L. Juárez* 3399 (CIIDIR). **Juárez:** aprox. 7 km al N del poblado [village] de Samalayuca, a los lados [sides] de la carr., 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5302 (UACJ); a orillas [edge] de la Carr. No 2 Juárez–Janos, km 128, 11 Aug 1996, *P. Olivas, R. Rivas & I. Enríquez* POS813 (UACJ); Ciudad Juárez, a lo largo [along] de la “Asequia Madre” entre [between] la Av. Américas & Paseo Triunfo de la República, 29 Sep 1995, 1140 m, *R. Corral, P. Olivas & L.M. Barraza* RCD6410 (UACJ). **Madera:** Paraje Sirupa, ejido Cebadilla de Dolores, 24 Ag 1990, bosque de encino [oak forest], 1220 m, *O. Bravo* 1260 (CIIDIR).

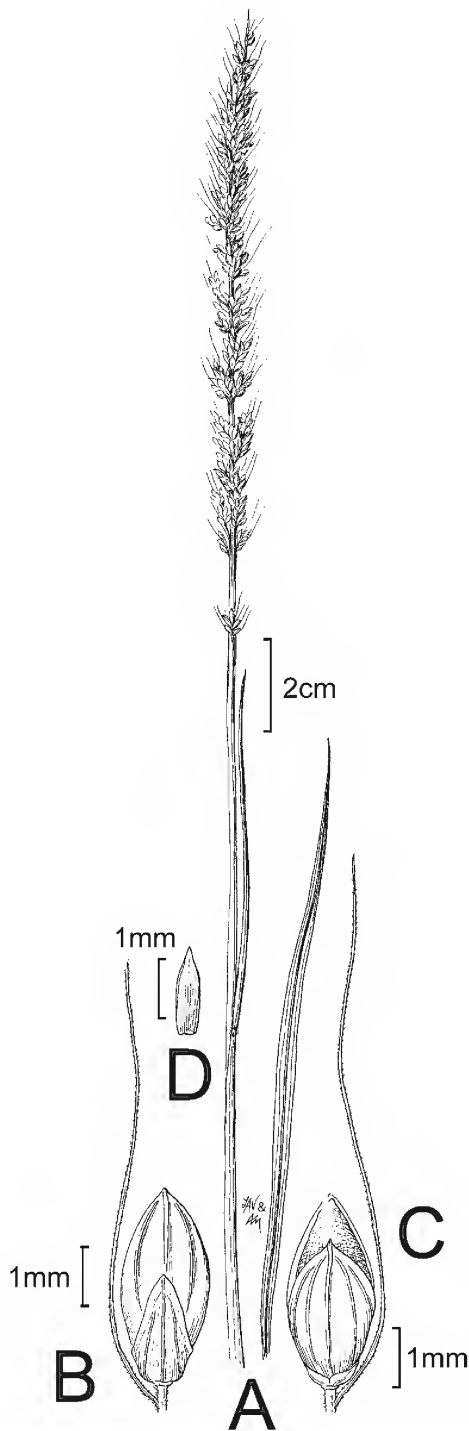


FIGURE 218. *Setaria leucopila*. A. Culm, inflorescence, and leaf blade. B. Spikelet showing lower glume. C. Spikelet showing upper glume. D. Lower palea. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

338. *Setaria liebmannii* E. Fourn., Mex. Pl. 2: 44. 1886.*Setaria rariflora* J. Presl.

Annual. Culms 30–90 cm tall. Sheaths glabrous, margins ciliate; ligules ciliate; blades to 20 cm long, 10–20 mm wide, flat, scabrous on both surfaces. Panicles 10–25 cm long, loosely spicate; rachises scabrous; bristles 7–15 mm long, solitary, slender, antrorsely scabrous. Spikelets 2–2.7(3) mm long; lower glumes about  $\frac{1}{3}$  as long as the spikelets, 3-veined; upper glumes and lower lemmas 7-veined, the 5 central veins coalescing at the apex; lower paleas absent; upper lemmas gibbous, strongly and coarsely transversely rugose; upper paleas similar to the upper lemmas.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Setaria liebmannii* in the United States is known only from southern Arizona, but it is a common species along the Pacific slope of northern Mexico to Nicaragua (Espejo Serna et al., 2000).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Batopilas, Aug 1885, *E. Palmer* 52, 110D (US); Intersección Arroyo de Santiago con el Río Batopilas, 6 km antes del pueblo [before town] de Batopilas, 10 Sep 1999, 600 m, *T. Lebgue, Quintana & E. Estrada* 2366 (NMC). **Jiménez:** El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, *D. Ramírez & M.L. Juárez* 3384 (CIIDIR). **Moris:** Along the trail south of Moris, near the Moris River, 23 Sep 1991, 700 m, *P. Jenkins* 91-112 (ARIZ). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional “Cascada de Basaseachic,” 18 km from the Cahuisori–Ocampo road on the road to Candamena, 7.5 km below Cruz, 24 Sep 1994, 1260 m, *Spellenberg, Corral & Estrada* 12184 (NMC). **Uruachi:** few km south of Moris, 23 Sep 1991, 700 m, *P. Jenkins* 91-76-A (ARIZ).

339. *Setaria macrostachya* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 110. 1815.

FIGURE 219

Densely caespitose perennial. Culms 60–120 cm tall, rarely branched distally, scabrous below the nodes and panicles. Sheaths keeled, glabrous, usually with a few white hairs at the throat; ligules 2–4 mm long, densely ciliate; blades 15–20 cm long, 7–15 mm wide, flat, adaxial surface scabrous. Panicles 10–30 cm long, 1–2 cm wide, uniformly thick from the base to the apex, dense, rarely lobed basally; rachises scabrous and loosely pilose; bristles 10–20 mm long, usually solitary, soft, antrorsely scabrous. Spikelets 2–2.3 mm long, subspherical; lower glumes  $\frac{1}{3}$ – $\frac{1}{2}$  as long as the spikelets, 3- to 5-veined; upper glumes about  $\frac{3}{4}$  as long as the spikelets, 5- to 7-veined; lower lemmas equaling the

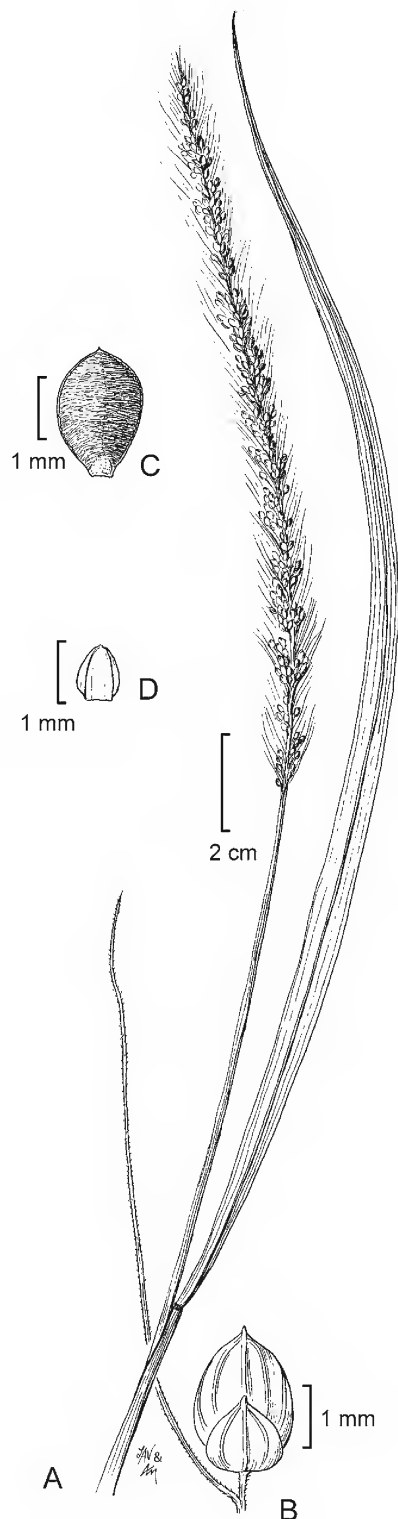


FIGURE 219. *Setaria macrostachya*. A. Inflorescence and leaf blade. B. spikelet. C. Upper lemma. D. Lower palea. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

upper lemmas, 5-veined; lower paleas nearly equaling the upper paleas in length and width; upper lemmas transversely rugose; upper paleas convex, ovate.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Setaria macrostachya* is abundant in the desert grasslands of the southwestern United States, particularly in southern Arizona and Texas. It extends south through the highlands of central Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aldama:** Santo Domingo, 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, P.M. Peterson & Annable 5751 (US); Rancho El torreño # 3, 25 Sep 1982, matorral inermis parvifolius [unarmed small-leaved scrub], 1150 m, G. Melgoza 35 (CIIDIR). **Chihuahua:** 54 mi N of Ciudad Chihuahua, 2 Sep 1958, Reeder & C. Reeder 3196 (US). **Guadalupe:** NE Chihuahua, vicinity of Rancho El Pino, ca 10 km, SE of Sierra Rica, 23 Sep 1942, bosque de encino [oak forest], 1100 m, R.M. Stewart 2396 (US). **Juárez:** km 32 Juárez-Chih., 13 Oct 1997, matorral de gobernadora [governor's scrub], 1300 m, I. Enríquez, S. Ordoñez & J. Leyva IEA3 (UACJ). **Manuel Benavides:** E Chihuahua, Coalhuila boundary, 1 mi E of Pozo de Villa, along rd from Ojinaga to Castillon, via La Mula, Trincheras, 12 Aug 1941, I.M. Johnston 8174 (US).

340. *Setaria parviflora* (Poir.) Kerguélen, Lejeunia, n.s. 120: 161. 1987. *Cenchrus parviflorus* Poir., Encycl. 6: 52. 1804. *Setaria geniculata* P. Beauv.

FIGURE 220

Perennial; with short, knotty rhizomes. Culms 30–120 cm tall; nodes glabrous. Sheaths glabrous; ligules shorter than 1 mm long, of hairs; blades to 25 cm long, 2–8 mm wide, flat, scabrous above. Panicles 3–8(10) cm long, of uniform width throughout their length, densely spikelike; rachises scabrous to hispid; bristles 2–12 mm long, 4–12, antrorsely barbed, yellow to purple. Spikelets 2–2.8 mm long, elliptical and turgid; lower glumes about  $\frac{1}{3}$  as long as the spikelets, 3-veined; upper glumes  $\frac{1}{2}$ – $\frac{2}{3}$  as long as the spikelets, 5-veined; lower florets often staminate; lower lemmas occasionally indurate and faintly transversely rugose; lower paleas equaling the lower lemmas; upper lemmas distinctly transversely rugose, often purple-tipped.  $2n = 36, 72$ .

**DISTRIBUTION AND HABITAT.** *Setaria parviflora* is a common, native species of moist ground. It is most frequent along the Atlantic and Gulf coasts, but it also grows from the Central Valley of California east through the central United States and southward through Mexico to Central America (Rominger 2003).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** aprox. 25 km al N del poblado [village] Flores Magón, 7 Oct 1995, 1140 m, R. Corral, P. Olivas & J.O. Torres RCD6455 (UACJ). **Balleza:** 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, bosque de pino-encino [pine-oak forest], 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10714 (CIIDIR, US). **Batopilas:** Yamuco at 1 km E of hwy towards

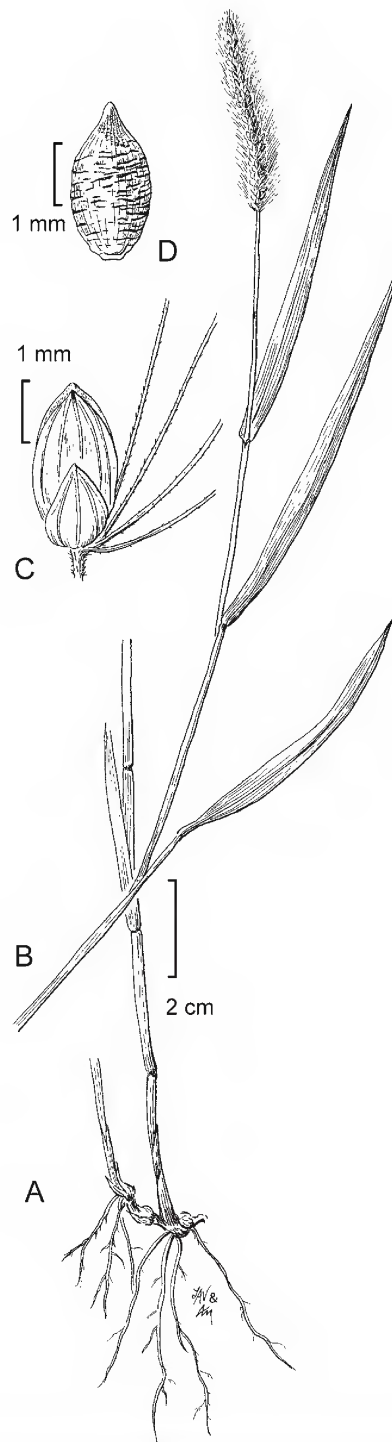


FIGURE 220. *Setaria parviflora*. A. Culm base. B. Culm and inflorescence. C. Spikelet. D. Upper lemma. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino, 1891 m, *P.M. Peterson & P. Catalán 17548* (US). **Bocoyna:** 3.7 km N of San Juanito on road to Creel, near km 53 marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable 5861b* (US). **Chinipas:** Sagarivó, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela 22117* (US). **Chihuahua:** La Campana; 1 km Pte. carr. [hwy] PanAmer., 14 Sep 1973, pastizal mediano abierto [mostly open grassland], 1570 m, *Valdés-Reyna VR-275* (RELC); La Campana, Jardín de observación [observation garden], 6 Oct 1974, 1500 m, *Valdés-Reyna VR-609* (RELC). **Cuautémoc:** 21 km W of Cuautémoc, on hwy 16, 23 Aug 1990, 2000 m, *P.M. Peterson & Annable 9599* (US). **Guerrero:** 11 km E of Tomochic on rd to La Junta, 5 Oct 1986, 2100 m, *Spellenberg, R. Soreng, R. Corral & T. Lebgue 8893* (NMC); entre [between] Cuautémoc & La Junta, 12 Aug 1976, orilla [edge] de carr., 2135 m, *S. González & J.M. Peña 552* (RELC). **Julimes:** Rancho La Tiznada, 26 Aug 1973, cultivo de zacate [cultivated grass] Alicia, 1500 m, *Valdés-Reyna VR-30* (RELC). **Madera:** Paraje El Negro, ejido El Largo, 1 Sep 1990, bosque de pino-encino, 1940 m, *O. Bravo 1434* (CIIDIR); proximidad a la Col. Chuichupa, 1 Nov 1990, pastizal & bosque [pastureland and grove] de *Juniperus deppeana*, 2240 m, *A. Benítez 2164* (CIIDIR); Laguna de Babicora, alrededores [surroundings] de Nicolas Bravo, 18 Aug 1994, 2200 m, *Quintana, Lebgue & Estrada 3143* (NMC). **Ocampo:** Parque Nacional “Cascada de Basaseachic”, 22 Sep 1990, 2100 m, *R. Corral RCD-3926* (NMC); Parque Nacional “Cascada de Basaseachic,” between parking lot and top of falls, along the trail to the top of the falls, 1 Aug 1988, 2000 m, *Spellenberg, R. Corral, J. Brunt & L. Huenneke 9591* (NMC); Parque Nacional “Cascada de Basaseachic,” at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8802* (NMC); Parque Nacional Cascada basaseachic, por la vereda que va de la parte alta de la cascada [along the path from the top of the waterfall] a “La Ventana”, 22 Sep 1990, bosque de pino-encino, 1980 m, *R. Corral RCD3926* (UACJ); 37 km W of Mex 45, and ca. 3.2 km W of Col. Cumbres de Majalca, 2170 m, *P.M. Peterson, Annable & Y. Herrera 7979* (US).

341. *Setaria pumila*\* (Poir.) Roem. & Schult., Syst. Veg. (ed. 15 bis) 2: 891. 1817. *Panicum pumilum* Poir., Encycl., Suppl. 4(1): 273. 1816.

*Setaria lutescens* (Weigel ex Stuntz) F. T. Hubb.

FIGURE 221

Annual. Culms 30–130 cm tall. Sheaths glabrous; ligules ciliate; blades 4–10 mm wide, flat to loosely twisted, adaxial surface with papillose-based hairs. Panicles 3–15 cm long, densely spicate, erect; rachises hispid; bristles 3–8 mm long, 4–12, antrorsely scabrous, yellowish. Spikelets 3–3.4 mm long, strongly turgid; lower glumes  $\frac{1}{3}$  as long as the spikelet, 3-veined, acute; upper glumes about  $\frac{1}{2}$  as long as the spikelet, 5-veined, ovate; lower lemmas equaling the upper lemmas; lower paleas

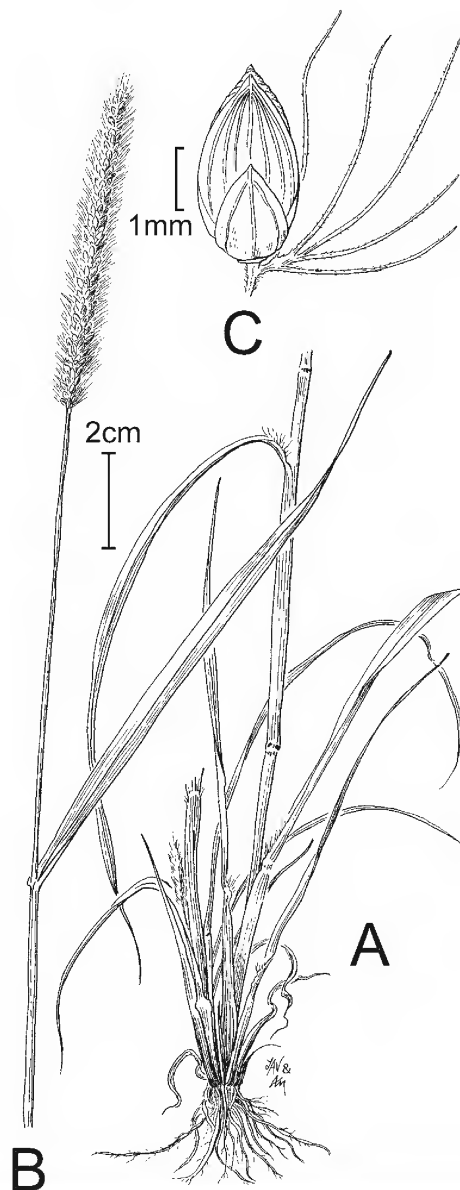


FIGURE 221. *Setaria pumila*. A. Habit. B. Inflorescence. C. Spikelet. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

equaling the lower lemmas; upper lemmas conspicuously exposed, strongly transversely rugose.  $2n = 36, 72$ .

**DISTRIBUTION AND HABITAT.** In Chihuahua we have *Setaria pumila* subsp. *pumila*, which is a common weed of lawns and cultivated fields throughout North America to central Mexico. This subspecies is native to Eurasia.

## SPECIMENS EXAMINED. MEXICO. Chihuahua.

**Camargo:** 5 km W of Camargo, 1220 m, 5 Aug 1939, *L.H. Harvey* 1413 (US). **Meoqui:** Lazaro Cardenas, 7 Aug 1974, 1250 m, *C. Rodríguez*, *O. Agundis* & *S. Acosta* 1222 (US).

342. *Setaria verticillata*\* (L.) P. Beauv., Ess. Agrostogr. 51, 171, 178. 1812.

Annual. Culms 30–100 cm tall; nodes glabrous. Sheaths glabrous, margins ciliate distally; ligules to 1 mm long, densely ciliate; blades 5–15 mm wide, flat, abaxial surfaces scabrous. Panicles 5–15 cm long, tapering to the apex; rachises retrorsely rough hispid; bristles 4–7 mm long, solitary, retrorsely scabrous. Spikelets 2–2.3 mm long; lower glumes about  $\frac{1}{3}$  as long as the spikelets, obtuse, 1(3)-veined; upper glumes nearly as long as the spikelets; lower paleas about  $\frac{1}{2}$  as long as the spikelets, broad; upper lemmas finely and transversely rugose; upper paleas similar to the upper lemmas.  $2n = 18, 36, 54, 72, 108$ .

**DISTRIBUTION AND HABITAT.** *Setaria verticillata* is a European adventive that is now common throughout the cooler regions of the contiguous United States and southern Canada and introduced to northern Mexico (Rominger, 2003). This species has been reported for Chihuahua (Dávila et al., 2006).

343. *Setaria villosissima* (Scribn. & Merr.) K. Schum., Just's Bot. Jahresber. 28(1): 417. 1902. *Chaetochloa villosissima* Scribn. & Merr., Bull. Div. Agrostol., U.S.D.A. 21: 34, f. 19. 1900.

Caespitose perennial. Culms 40–100 cm tall. Sheaths villous distally, margins ciliate; ligules about 1 mm long, densely ciliate, hairs white; blades 15–30 cm long, 5–8 mm wide, both surfaces villous. Panicles 10–20 cm long, loosely spicate; bristles 10–20 mm long, usually solitary. Spikelets 2.8–3.2 mm long; lower glumes about  $\frac{1}{3}$  as long as the spikelets, broadly ovate, 3-veined; upper glumes nearly equaling the spikelets, 5- to 7-veined; lower lemmas equaling the upper lemmas, 5-veined; lower paleas about  $\frac{1}{5}$  as long as the upper paleas, lanceolate; upper lemmas finely and transversely undulate-rugose basally, striate and punctate distally; upper paleas similar, ovate-lanceolate.  $2n = 54$ .

**DISTRIBUTION AND HABITAT.** *Setaria villosissima* is a rare species that grows on granitic soils in southwestern Texas and northern Mexico. This species has been reported for Chihuahua (Espejo Serna et al., 2000; Dávila et al., 2006).

344. *Setaria viridis*\* (L.) P. Beauv., Ess. Agrostogr. 51: 178. 1812. *Panicum viride* L., Syst. Nat. (ed. 10) 2: 870. 1759.

FIGURE 222

Annual. Culms 20–250 cm tall; nodes glabrous. Sheaths glabrous, sometimes scaberulous, margins ciliate distally; ligules 1–2 mm long, ciliate; blades to 20 cm long, 4–25 mm wide, flat, scabrous or smooth, glabrous. Panicles 3–20 cm long, densely spicate, nodding only from near the apex; rachises hirsute and villous; bristles 5–10 mm long, 1–3, antrorsely scabrous, usually green, rarely purple. Spikelets 1.8–2.2 mm long; lower glumes about  $\frac{1}{3}$  as long as the spikelets, triangular-ovate, 3-veined; upper glumes

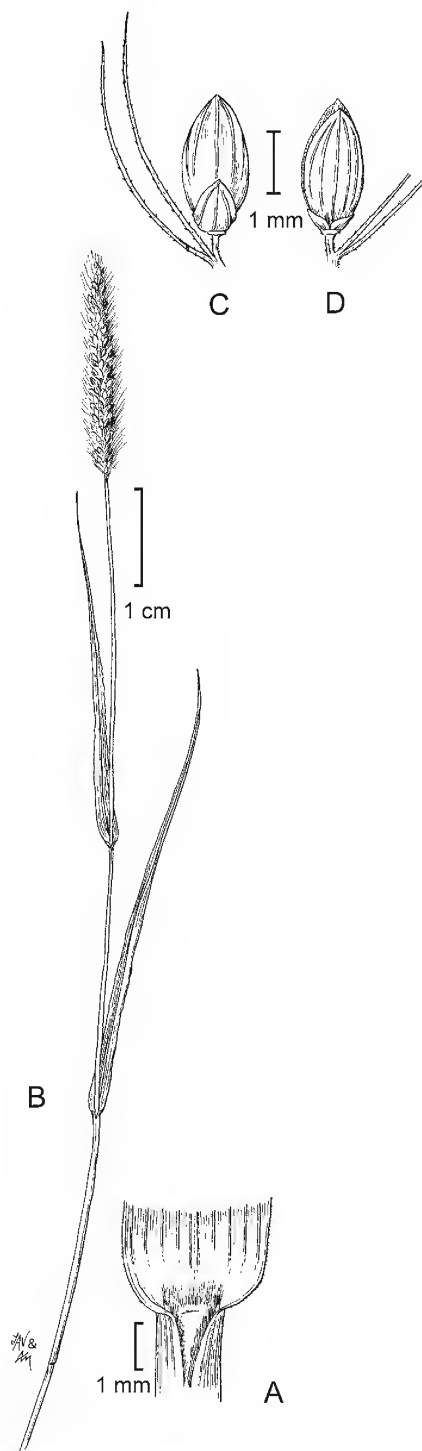


FIGURE 222. *Setaria viridis*. A. Ligule. B. Culm and inflorescence. C. Spikelet showing lower glume. D. Spikelet showing upper glume. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.



nearly equaling the upper lemmas, elliptical, 5- to 6-veined; lower lemmas slightly exceeding the upper lemmas, 5-veined; lower paleas about  $\frac{1}{3}$  as long as the lower lemmas, hyaline; upper lemmas very finely and transversely rugose, pale green, 5- to 6-veined; upper paleas similar to the upper lemmas.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Setaria viridis* is an aggressive weed native to Eurasia (Rominger, 2003).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Manuel Benavides: entre [between] Manuel Benavides & Pocitos, 2 Aug 1976, matorral [scrub], 1454 m, S. González & J.M. Peña 475 (RELC). Riva Palacio: km 109 carr. [hwy] Chihuahua-El Sueco, 6 Oct 1978, matorral de prosopis, 1675 m, A. Melgoza s.n. (CIIDIR).

### *Setariopsis* Scribn.

Annual. Culms solid, branching above the base. Sheaths open; ligules of hairs; blades flat. Inflorescence a terminal panicle

with pilose rachises; branches with spikelets congested, shortly pedicellate, subtended by a terete bristle; disarticulation below the glumes. Spikelets dorsally compressed, with 2 florets, lower florets usually sterile, upper florets bisexual. Lower glumes about  $\frac{1}{4}$  the length of spikelets, 5- to 7-veined, subclaspings; upper glumes slightly shorter than the spikelets, 11- to 19-veined, indurate at maturity, constricted at the base, auriculate above the point of constriction; lower lemmas longer than the glumes, membranous but somewhat indurate at the base; lower paleas usually present, short; upper lemmas indurate, finely transversely rugose, apiculate, margins clasping the paleas; upper paleas similar to the lemmas in length and texture; lodicules 2; anthers 3, purple; ovaries glabrous; style branches 2, free to the base. Caryopsis ovate, plano-convex; embryos about  $\frac{1}{2}$  as long as the caryopsis.  $x = 9$ .

*Setariopsis* includes two species that are found in open, mostly tropical forests of North, Central, and South America.

### KEY TO SPECIES OF *SETARIOPSIS*

1. Sheaths mostly glabrous, with soft hairs near the ligule; upper glumes 2–2.2 mm long, margins involute, resembling auricles; sterile lemmas 2–2.5 mm long, ovate, thicker on margins, apex obtuse . . . . . *S. auriculata*
1. Sheaths hispid, with papillose-based hairs; upper glumes 3–3.2 mm long, oblate, not auriculate at base; sterile lemmas 3–3.5 mm long, apex oblong, emarginate . . . . . *S. latiglumis*

345. *Setariopsis auriculata* (E. Fourn.) Scribn., Publ. Field Colombian Mus., Bot. Ser. 1(3): 289. 1896. *Setaria auriculata* E. Fourn., Mexic. Pl. 2: 43. 1886.

Caespitose annual. Culms 15–60 cm tall, weak, erect or ascending, glabrous or with a few short, appressed hairs on and immediately below the nodes. Sheaths mostly glabrous with soft hairs near the ligule; ligules 1–1.5 mm long; blades 3–25 cm long, 2–12 mm wide, apex acuminate, glabrous or with a few hairs on the collars. Panicles 3–15 cm long, 0.8–1.5 cm wide; branches 0.5–2 cm long, spikelets congested, shortly pedicellate; pedicels to 0.5 mm long, oblong, subtended by a terete bristle; bristles 3–8 mm long, persistent, antrorsely barbed. Spikelets 2–2.5 mm long, ovate, apex obtuse, falling entire; rachilla internodes elongated between glumes; glumes unequal, same size as florets, thinner than fertile lemma; lower glumes about 1 mm long, 3-veined, oblate, membranous, apex obtuse; upper glumes 2–2.2 mm long, 11- to 13-veined, ovate, gibbous, membranous or coriaceous at maturity, margins involute (resembling auricles), apex obtuse; sterile lemmas 2–2.5 mm long, ovate, membranous or coriaceous at maturity, thicker on margins, sulcate, apex obtuse, paleas  $\frac{1}{4}$  the length of the lemma, hyaline; fertile lemmas 2–2.5 mm long, indurate, transversely rugose, margins involute, apex acute; palea indurate, rugose; anthers 0.8–1 mm long, purple.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Setariopsis auriculata* occurs in moist, shady habitats and ranges from Arizona through Mexico and Central America to Colombia and Venezuela.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Batopilas: southwestern Chihuahua, Aug 1885, E. Palmer 78 (US).

346. *Setariopsis latiglumis* (Vasey) Scribn., Publ. Field Colombian Mus. Bot. Ser. 1(3): 289–290, t. 11. 1896. *Setaria latiglumis* Vasey, Bull. Torrey Bot. Club 13(12): 229. 1886.

Caespitose annual. Culms (40)70–100 cm tall, erect; nodes papillous-hispid. Sheaths hispid, with papillose-based hairs; ligules 2–2.5 mm long, a fringe of hairs; blades 10–30 cm long, 5–9 mm wide, scaberrulous and sparsely hairy, margins scabrous. Panicles 4–20 cm long, 1–2 cm wide, spiciform, linear or lanceolate, truncate or rounded at the ends, or tapering above; branches with spikelets congested, short pedicellate, subtended by a terete bristle, the bristles 7–10 mm long, persistent, antrorsely scaberrulous. Spikelets 3–3.5 mm long, oblong or ovate, gibbous, falling entire; glumes unequal, oblate, gibbous, exceeding or reaching apex of florets, thinner than fertile lemmas; lower glumes 1–1.3 mm long, 2-veined, upper glumes 3–3.2 mm long, 17- to 19-veined, herbaceous or indurate, firmer above, apex entire to erose, obtuse to cuspidate; sterile lemmas 3–3.5 mm long, 9-veined, membranous or coriaceous at maturity, firmer above, emarginate, paleas  $\frac{1}{5}$  as long as the sterile lemma, pilose; fertile lemmas 2–3 mm long, 5-veined, finely rugulose to tuberculate over the surface, indurate, pallid, lightly keeled, margins involute, apex cuspidate; paleas almost as long as lemma, indurate, thinner on margins, surface tuberculate; anthers 3, 0.5–0.7 mm long. Caryopsis ovoid, with adherent pericarp.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Setariopsis latiglumis* grows in tropical forests and thorny scrub. This species is endemic to Mexico, occurring in Chiapas, Chihuahua,

Guanajuato, Guerrero, México, Michoacán, Morelos, Nayarit, and Puebla (Dávila et al., 2006).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** km 20 Cd. Cuauhtémoc de Cd. Chihuahua, Aug 1885, *E. Palmer* 117A (US). **Ocampo:** Ca 1 km W of W boundary of Parque Nacional "Cascada de Basaseachic," 18 km from the Cahuisorí-Ocampo road on the road to Candamena, 7.5 km below Cruz, 24 Sep 1994, 1260 m, *Spellenberg, Corral & Estrada* 12187-A (NMC). **Uruachi:** Rio Mayo between Moris and San Bernardo. 25 Sep 1991, grassland, 580 m, *P. Jenkins* 91-78 (ARIZ).

### *Sorghastrum* Nash

Annual or perennial; caespitose, sometimes rhizomatous. Culms erect, nodding or clambering, unbranched; nodes densely pubescent, particularly in young plants. Leaves not aromatic;

ligules membranous, glabrous or pubescent; blades flat, involute, or folded. Inflorescence a terminal, secund or equilateral panicle with evident rachises and numerous branches, not subtended by modified leaves; branches capillary, rebranching, with many rames; disarticulation in the rames, beneath the sessile spikelets. Spikelets sessile, subtending a hairy pedicel (2 pedicels in the terminal spikelet units), dorsally compressed; callus blunt or sharp; glumes coriaceous; lower glumes pubescent, 5- to 9-veined, acute; upper glumes slightly longer, usually glabrous, 5-veined, truncate; lower florets reduced to a hyaline lemma; upper florets bisexual, lemmas hyaline, bifid, awned from the sinuses; awns usually once- or twice-geniculate, often spirally twisted, shortly strigose, brownish; anthers 3; ovaries glabrous. Caryopsis flattened; pedicels slender, not fused to the same axes; pedicellate spikelets absent.  $x = 10$ .

*Sorghastrum* includes about 21 species.

### KEY TO SPECIES OF *SORGHASTRUM*

1. Panicles with only a few branches near the apex of the inflorescence, the branches flexuous and elongate, the spikelets inserted at the end of the branches ..... *S. nudipes*
1. Panicles with numerous branches near the apex, these appearing dense and crowded, the spikelets numerous along the branches, the branches usually rebranched ..... *S. nutans*

#### 347. *Sorghastrum nudipes* Nash, N. Amer. Fl. 17(2): 129. 1912.

Caespitose perennial with elongated rhizomes; basal innovations extravaginal. Culms 55–120 cm tall, 1–2.5 mm thick, erect, glabrous. Sheaths smooth, glabrous; ligules 15–25 mm long, eciliate membrane; blades 10–30 cm long, 2–5 mm wide, flat, smooth, glabrous or pubescent, margins scabrous, apex acute. Panicles 8–22 cm long, open, lax, with only a few branches near the apex, the branches flexuous and long, the spikelets inserted at the end of the branches; rachis internodes filiform. Spikelets 5.5–7.5(9) mm long, lanceolate, hirsute, falling entire; bisexual spikelets with 1 basal sterile floret and 1 fertile; glumes equal, firmer than fertile lemma, as long as spikelet, oblong, chartaceous or coriaceous; lower glumes 7- to 9-veined, pubescent, apex truncate; upper glumes 5-veined, glabrous or pubescent, hairy below, apex acute; sterile lemmas 5–6.5 mm long, oblong, hyaline, 2-veined, ciliate on margins, apex 2-lobed, palea minute; fertile lemmas 3.5–5.3 mm long, oblong, hyaline, 3-veined, ciliate on margins, apex 2-lobed, awned, the awn 12–18 mm long, straight or geniculate, with twisted column, column hirsute, palea absent or minute; anthers 3–4 mm long. Caryopsis 2–3 mm long.

**DISTRIBUTION AND HABITAT.** *Sorghastrum nudipes* is native to Mexico and is known from Chihuahua and Durango (Herrera Arrieta, 2014).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 11 (US). **Gua-chohi:** 2 km al NE de Norogachic (Tucheachi), 24 Sep 1985, bosque de pino-encino [pine-oak forest], 2100 m, *Dávila,*

*Tenorio & I. Solis* 132 (CIIDIR); 16 km al E de la desviación [deviation] a la Bufo, en el camino [road] Guachochi–Creel, 25 Sep 1985, *P. Dávila* 142 (ARIZ). **Madera:** Laguna de Baticora, Arroyo Las Varas, 10 Sep 1994, 2300 m, *G. Quintana & E. Estrada* 3565 (NMC). **Ocampo:** Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8693 (NMC).

#### 348. *Sorghastrum nutans* (L.) Nash, Fl. S.E. U.S. 66, 1326. 1903. *Andropogon nutans* L., Sp. Pl. 2: 1045. 1753.

#### FIGURE 223

Perennial; with elongated, stout, and scaly rhizomes. Culms 50–230 cm tall, 1.5–4.5 mm thick below, erect, glabrous. Sheaths glabrous or sparsely hispid; ligules 2–5 mm long, eciliate membrane, auricles thick and pointed; blades 10–50 cm long, 1–4 mm wide, glabrous or pubescent, margins scabrous, apex attenuate. Panicles 10–35 cm long, open to loosely contracted, oblong, dense, yellowish to brownish, with numerous branches near the apex, these appearing dense and crowded, the spikelets numerous along the branches, the branches usually rebranched; rachis terete. Spikelets 5–8.7 mm long, lanceolate, falling entire; bisexual spikelets bearing 1 basal sterile floret and 1 fertile, callus bearded; glumes equal, 5–8 mm long, firmer than fertile lemma, as long as spikelet, oblong, coriaceous, light brown; lower glumes 7- to 9-veined, pubescent, apex truncate; upper glumes 5-veined, glabrous, apex acute; sterile lemmas 4–6 mm

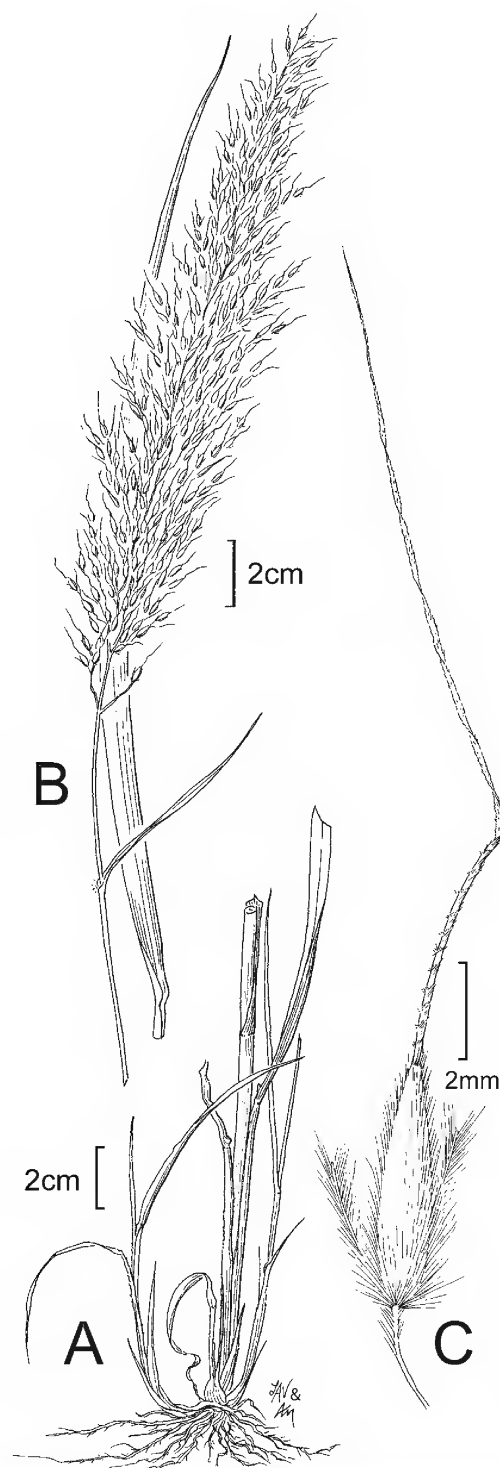


FIGURE 223. *Sorghastrum nutans*. A. Habit. B. Inflorescence. C. Sessile spikelet. Drawn by Linda Ann Vorobik and Annaliese Miller; copyright Utah State University.

long, oblong, hyaline, 2-veined, ciliate on margins, apex 2-lobed, palea minute; fertile lemmas 3.5–5.5 mm long, oblong, hyaline, 3-veined, ciliolate on margins, apex 2-lobed, awned, the awns 10–22 mm long, geniculate, with twisted column, column hirsute, palea absent or minute; anthers 3–5 mm long. Caryopsis 2.3 mm long.  $2n = 20, 40, 80$ .

**DISTRIBUTION AND HABITAT.** *Sorghastrum nutans* grows in a wide range of habitats, from prairies to woodlands, savannahs, and scrubland vegetation. It is native in North America from Canada to Mexico, and South America in Brazil.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** La Campana, 24 Sep 76, Jardines de observación [observation gardens], 1500 m, S. González 767 (RELC). **Guachochi:** Entering Barranca El Cobre, 28.3 km S of Cusarare on road to Guachochi, 25 Sep 1988, pine forest, 1900 m, P.M. Peterson & Annable 5903 (ENCB, US); 1–2 km S of Río Osichi Canyon and Río Basihuare jct, 1 Sep 2003, bosque [forest] de *Quercus-Pinus*, 1600 m, P.M. Peterson & P. Catalán 17630 (CIIDIR, US). **Madera:** 25 km al NW de Las Varas, 28 Oct 1976, bosque de pino encino [pine-oak forest], 2100 m, J.M. Peña JMP-809 (RELC). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” on ridge top SE side of canyon of Río Basaseachic leading to falls, 4 Oct 1986, 1800 m, Spellenberg, Soreng, R. Corral & T. Lebgue 8731 (NMC); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, P.M. Peterson & R.M. King 8229 (US).

### *Sorghum Moench*

Annual or perennial. Culms internodes solid. Leaves not aromatic, basal and cauline; auricles absent; ligules membranous and ciliate or of hairs; blades usually flat. Inflorescence a terminal, panicle with evident rachises; primary branches whorled, compound, the ultimate units rames; rames with most spikelets in heterogamous sessile-pedicellate spikelet pairs, terminal spikelet unit on each rame usually a triplet of 1 sessile and 2 pedicellate spikelets, rame axes without a translucent median line; disarticulation in the rames below the sessile spikelets, sometimes also below the pedicellate spikelets (cultivated taxa not or only tardily disarticulating); pedicels slender, neither appressed nor fused to the rame axes. Sessile spikelets dorsally compressed, calluses blunt or pointed; lower glumes dorsally compressed and rounded basally, 2-keeled or winged distally, 5- to 15-veined, usually unawned; upper glumes 2-keeled, sometimes awned; lower florets reduced to hyaline lemmas; upper florets pistillate or bisexual, lemmas hyaline, sometimes awned. Pedicellate spikelets staminate or sterile, well-developed, often subequal to the sessile spikelets in size.  $x = 10$ .

Most of the approximately 32 species of *Sorghum* are native to tropical and subtropical regions of the Eastern Hemisphere (Liu et al., 2014).

KEY TO SPECIES OF *SORGHUM*

1. Perennials with rhizomes; spikelets disarticulating at maturity; caryopsis not exposed at maturity . . . . . *S. halepense*  
 1. Plants usually annual, sometimes short-lived perennial; spikelets either not disarticulating or doing so tardily; caryopsis often longer than glumes and exposed at maturity . . . . . *S. bicolor*

349. *Sorghum bicolor*\* (L.) Moench, Methodus 207. 1794.

FIGURE 224

Annual or short-lived perennial; often tillering, without rhizomes. Culms 50–500+ cm tall, 1–5 cm thick, sometimes branching above the base; nodes glabrous or appressed-pubescent; internodes glabrous. Ligules 1–4 mm long; blades 5–100 cm long, 5–100 mm wide, sometimes glabrous. Panicles 5–60 cm long, 3–30 cm wide, open or contracted, primary branches compound, terminating in rames with 2–7 spikelet pairs; disarticulation usually not occurring or tardy. Sessile spikelets 3–9 mm long, lanceolate to ovate, bisexual; calluses blunt; glumes coriaceous to membranous, glabrous, densely hirsute, or pubescent, keels usually winged; upper lemmas unawned or with a geniculate, twisted awn, the awn 5–30 mm long; anthers 2–2.8 mm long. Pedicellate spikelets 3–6 mm long, usually shorter than the sessile spikelets, staminate or sterile; pedicels 1–2.6 mm long. Caryopsis usually exposed at maturity.  $2n = 20, 40$ .

**DISTRIBUTION AND HABITAT.** *Sorghum bicolor* was domesticated in Africa 3,000 years ago, reaching northwestern India before 2500 BCE (Before the Common Era), and became an important crop in China after the Mongolian conquest. It was introduced to the Western Hemisphere in the early sixteenth century and is now an important crop in the United States and Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Práxedes G. Guerrero:** Rancho Escuela, km 65 carr. [hwy] Juárez–Porvenir, 16 Aug 1997, cultivo de sorgo [cultivated *Sorghum*], 1400 m, I. Enríquez, S. Ordoñez, L. Sushii, A. Perales & N. Loyola IEA12 (UACJ).

350. *Sorghum halepense*\* (L.) Pers., Syn. Pl. 1: 101. 1805. *Holcus halepensis* L., Sp. Pl. 2: 1047–1048. 1753.

FIGURE 225

Perennial; rhizomatous. Culms 50–200 cm tall, 0.4–2 cm thick; nodes appressed-pubescent; internodes glabrous. Ligules 2–6 mm long, membranous, conspicuously ciliate; blades 10–90 cm long, 8–40 mm wide. Panicles 10–50 cm long, 5–25 cm wide, primary branches compound, terminating in rames of 1–5 spikelet pairs; disarticulation usually beneath the sessile spikelets, sometimes also beneath the pedicellate spikelets. Sessile spikelets 3.8–6.5 mm long, 1.5–2.3 mm wide, bisexual; calluses blunt; glumes indurate, shiny, appressed-pubescent; upper lemmas unawned, or with a geniculate, twisted awn, the awn to 13 mm long; anthers 1.9–2.7 mm long. Pedicellate spikelets 3.6–5.6 mm long; glumes membranous to coriaceous, unawned, staminate;

pedicels 1.8–2.7 mm long. Caryopsis not exposed at maturity.  $2n = 20, 40$ , and several dysploid counts also reported.

**DISTRIBUTION AND HABITAT.** *Sorghum halepense* is native to the Mediterranean region. It is sometimes grown for forage in North America, but it is considered a serious weed in warmer parts. It hybridizes readily with *S. bicolor* and derivatives of such hybrids are widespread.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** aprox. 7 km al N del poblado [village] de Samalayuca, a los lados [sides] de la carr. [hwy], 30 Jul 1994, 1200 m, R. Corral, E. Pérez, A. Domínguez & F. Félix RCD5286 (UACJ). **Ascensión:** a los lados de la carr. Juárez–Janos, en los alrededores [around] de la Falla del Camello, area de transición del desierto [desert transition area] “Cabeza de Vaca”, 11 Jun 2005, 1180 m, R. Corral, M. Vargas & H. Gutiérrez RCD7169 (UACJ). **Chihuahua:** La Campana, 24 Sep 76, Jardines de observación [observation gardens], 1500 m, S. González 268, 768, 770 (RELC). **Galeana:** Cerro Angostura Spring, 2.4 mi by Mexico hwy 10, N of Angostura, 3.7 mi E of hwy, Rio Santa Maria Valley at N tip of Cerro Angostura, 8 Oct 1982, 2200 m, F.W. Reichenbacher 1308 (ARIZ). **Juárez:** a orillas [edges] de la Carr. No 2 Juárez–Janos, km 128, 11 Aug 1996, P. Olivas, R. Rivas & I. Enríquez POS815 (UACJ); Ciudad Juárez a lo largo [along] de la “Asequia Madre” al N del fracc. Rincones de San Marcos, 13 Oct 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6548 (UACJ); Parque “El Chamizal”, 7 Sep 1995, maleza de prados & canales de riego [grass meadow and irrigation canals], 1120 m, R. Corral RCD6297 (UACJ); Ciudad Juárez a lo largo de la “Asequia Madre” desde la intersección de las calles [from the intersection of streets] Mejía & Santos Degollado, hasta el túnel bajo [until tunnel under] el Viaducto Díaz Ordaz, 3 Jun 1995, 1140 m, R. Corral & L.M. Barraza RCD6118 (UACJ); Ciudad Juárez, a lo largo de la “Asequia Madre” entre [between] la Av. Américas & Paseo Triunfo de la República, 29 Sep 1995, 1140 m, R. Corral, P. Olivas & L.M. Barraza RCD6426 (UACJ). **Jiménez:** El Hugo, Torreoncitos, 13 Aug 2010, terrenos de cultivo [farmland], 1355 m, D. Ramírez & M.L. Juárez 3383 (CIIDIR). **Práxedes G. Guerrero:** Rancho Escuela, km 65 carr. Juárez–Porvenir, 13 Oct 1997, pastizal [pastureland], 1300 m, I. Enríquez, S. Ordoñez & J. Leyva IEA13 (UACJ).

***Sphenopholis* Scribn.**

Plants usually perennial, rarely winter annual; usually caespitose. Culms sometimes solitary, leaves evenly distributed. Sheaths open; auricles absent; ligules membranous, erose; blades flat or involute, glabrous or pubescent. Inflorescence a panicle,



FIGURE 224. *Sorghum bicolor*. A. Habit. B. Spikelet pair. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

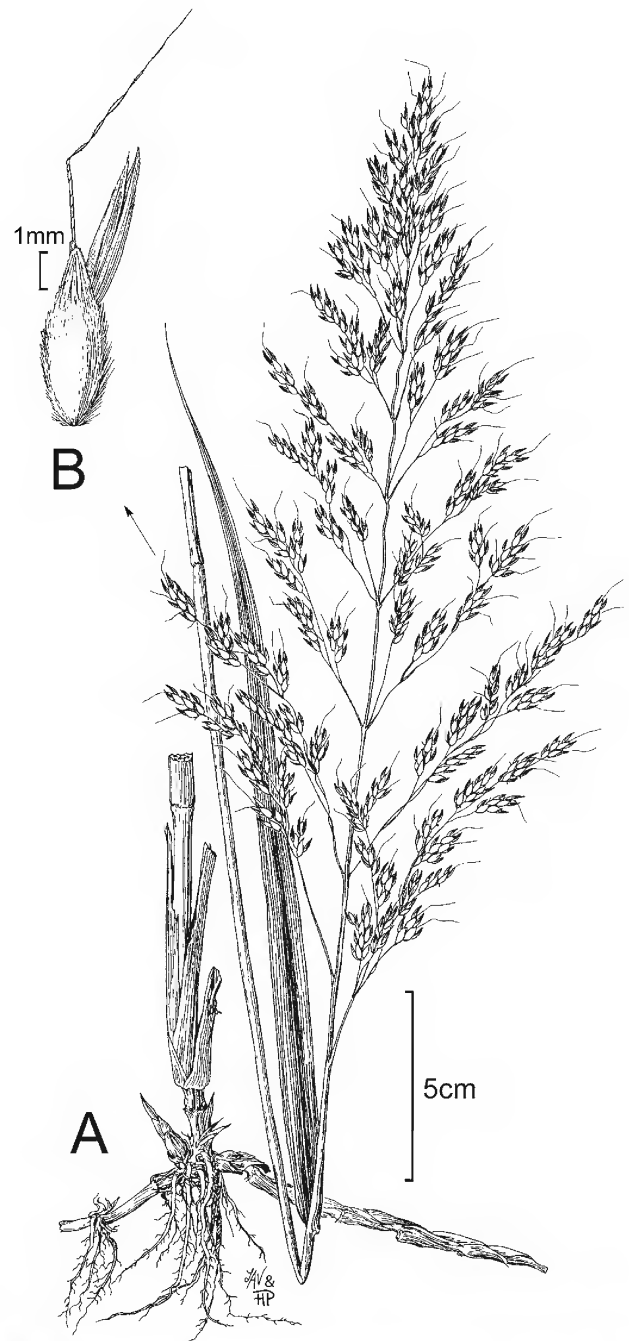


FIGURE 225. *Sorghum halpense*. A. Habit. B. Spikelet pair. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



open or contracted, nodding to erect; disarticulation below the glumes, the distal floret sometimes disarticulating first. Spikelets pedicellate laterally compressed, with 2–3 florets; rachillas glabrous or pubescent, prolonged beyond the base of the distal floret as a slender bristle; glumes almost equaling the lowest floret, dissimilar in width, membranous to subcoriaceous, margins scarious, apex unawned; lower glumes narrower than the upper glumes, 1(3)-veined, strongly keeled, apex acute; upper glumes elliptical to oblanceolate, obovate, or subcucullate, 3(5)-veined, strongly to slightly keeled, apex acuminate, acute, rounded, or truncate; calluses glabrous; lemmas herbaceous, not indurate, rounded on the lower back, smooth or partly or wholly scabrous, usually keeled near the apex, 3(5)-veined, veins usually not visible, unawned or awned from just below the apex, awns straight or geniculate; paleas hyaline, shorter than the lemmas; lodicules 2, free, membranous, glabrous, toothed or entire; anthers 3; ovaries glabrous. Caryopsis shorter than the lemmas, concealed at maturity, linear-ellipsoid, glabrous; endosperm liquid.  $x = 7$ .

*Sphenopholis* includes five species and is most diverse in the southeastern United States (Finot et al., 2004). One species, *Sphenopholis obtusata*, extends outside the United States to southern Mexico and the Caribbean.

351. *Sphenopholis obtusata* (Michx.) Scribn., *Rhodora* 8(92): 144. 1906. *Aira obtusata* Michx. *Fl. Bor.-Amer.* 1: 62. 1803.

FIGURE 226

Culms (9)20–130 cm tall. Sheaths glabrous or hairy, sometimes scaberulous; ligules (1)1.5–2.5 mm long, erose-ciliate, more or less lacerate; blades 5–14 cm long, (1)2–8 mm wide, usually flat, rarely slightly involute, scabrous or pubescent. Panicles (2)5–15(25) cm long, 0.5–2 cm wide, usually erect, often spike-like, spikelets usually densely arranged. Spikelets 2.2–3.6 mm long; lower glumes less than  $\frac{1}{3}$  as wide as the upper glumes; upper glumes 1.5–2.5 mm long, subcucullate, width:length ratio 0.3–0.5, apex rounded to truncate; lowest lemmas 1.9–2.8 mm long, usually scaberulous distally; distal lemmas usually smooth on the sides, occasionally scabrous, unawned; anthers 0.2–1 mm long.  $2n = 14$ .

**DISTRIBUTION AND HABITAT.** *Sphenopholis obtusata* grows in prairies, marshes, dunes, forests, and waste places up to 2,500 m. Its range extends from British Columbia to New Brunswick, through most of the United States to southern Mexico and the Caribbean (Finot et al., 2004). This species has been reported from Chihuahua (Espejo Serna et al., 2000).



FIGURE 226. *Sphenopholis obtusata*. A. habit. B. Glumes. C. Lower floret. D. Upper floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

## ***Sporobolus* R. Br.**

Annual or perennial; sometimes rhizomatous, rarely stoloniferous. Culms 10–250 cm tall, erect, rarely mat-forming, caespitose (often forming large clumps), glabrous. Sheaths longer or shorter than the internodes usually with smooth margins, occasionally ciliate; ligule ciliate, a line of hairs; blades 3–70 cm long, 1–15 mm wide at base, filiform or linear, flat, involute, or terete, not pungent, cauline without auricles. Inflorescence 0.5–80 cm long, 0.3–30 cm wide, a panicle or spikes (multiple branches) that bear 2 rows on 2 sides of a somewhat flattened, triangular rachis (that superficially appears to be 1-sided or pectinate); exserted or partially included in upper sheath; rachis smooth; primary branches appressed, spreading, divaricate, or reflexed from the main axis, solitary or loosely whorled, sometimes with capillary branches terminating in a spikelet; secondary branches appressed or spreading; pedicels erect, rarely secund, glabrous, scaberulous or scabrous; cleistogamous spikelets occasionally present, in axillary inflorescences. Spikelets 1–4(7) mm long, solitary, laterally or dorsally compressed, sometimes terete; disarticulation usually above the glumes, commonly above the upper

glume, occasionally below with the lemma and palea falling as a unit; glumes shorter or longer than the florets, very unequal, smooth, glabrous; lower glume without midvein or 1-veined; upper glume about the same length as the lemma, usually awnless, 1-veined; florets 1 per spikelet; lemma entire, awnless, glabrous or hairy, pubescent to pilose, 1-veined, rarely 3-veined, membranous with glabrous veins; palea glabrous, smooth, membranous, margins not enfolding the fruit, 2-veined, often splitting as grain matures; lodicules 2 or sometimes absent, truncate; stamens 2 or 3; anthers yellow, reddish-purple, or olivaceous-plumbeous; stigmas 2. Modified caryopsis a folioid fruit with a free pericarp, commonly swelling and mucilaginous when wet; hilum punctiform; embryo with an epiblast, scutellar tail, and elongated mesocotyl internode, endosperm hard.  $x = 9, 10$ .

*Sporobolus* is a cosmopolitan genus of nearly 200 species that grow in tropical, subtropical, and warm-temperate regions throughout the world (Peterson et al., 2003, 2004, 2014b). Eleven species are present in Chihuahua. The genus as currently circumscribed includes all species formerly placed in *Spartina* Schreb., *Crypsis* Aiton, and *Calamovilfa* (A. Gray) Hack. ex Scribn. & Southw. (Peterson et al., 2014b).

### KEY TO SPECIES OF *SPOROBOLUS*

1. Inflorescence composed of 3–25 spikes, each spike 5–15 cm long bearing sessile spikelets on 2 rows on 2 sides of a somewhat flattened, triangular rachis (that superficially appears to be 1-sided or pectinate) ..... *S. alterniflorus*
1. Inflorescence a true panicle with branches that rebranch and the spikelets pedicellate.
  2. Annuals; culms 10–40 cm tall ..... *S. pyramidatus*
  2. Perennials; culms 30–250 cm tall.
    3. Sheaths and collar with a conspicuous tuft of white hairs.
      4. Panicles contracted, spikelike; branches appressed.
        5. Culms 35–100(120) cm tall, 2–4 mm diameter near the base ..... *S. contractus*
        5. Culms 100–200 cm tall, (3)4–10 mm diameter near the base ..... *S. giganteus*
      4. Panicles open, branches spreading at least from the middle of the rachis to the apex, the base sometimes included.
        6. Panicles usually exserted, branches divaricate and flexuous, usually tangled with each other; lower glumes 0.9–1.5 mm long ..... *S. flexuosus*
        6. Panicles usually included at the base, branches erect, not markedly flexuous and not tangled; lower glumes 0.6–1.1 mm long ..... *S. cryptandrus*
    3. Sheaths and collar glabrous.
      7. Panicles 0.3–3 cm wide, spikelike, the branches appressed to the main axis.
        8. Panicles 9–15(20) cm long, 3–5(10) mm wide, whitish; culms tufted; glumes unequal, more than  $\frac{2}{3}$  as long as the floret ..... *S. spiciformis*
        8. Panicles 20–35(50) cm long, 3–22(3) mm wide, stramineous; culms weakly tufted; glumes about equal, less than  $\frac{2}{3}$  as long as the floret ..... *S. indicus*
      7. Panicles 3–25 cm wide (sometimes only 0.3 cm wide in immature *S. pyramidatus*), open, the branches widely spreading at least from the middle of the rachis to the apex.
        9. Panicle branches capillary, the proximal ones solitary; pedicels capillary, 2.5–3(4) mm long, flexuous; upper glumes 0.7–1 mm long ..... *S. trichodes*
        9. Panicle branches not capillary, the proximal ones whorled; pedicels not capillary, 0.3–3 mm long, spreading or appressed; upper glumes (0.8)1.4–2.5 mm long.
          10. Panicle branches widely divaricate and flexuous, usually tangled with each other ..... *S. flexuosus*
          10. Panicle branches widely open or erect, not tangled.
            11. Culms 10–40 cm tall, delicate perennials, plants small; leaf blades borne near the base; sheaths glabrous or with few ciliate hairs on the margins and summit ..... *S. pyramidatus*

11. Culms 30–100(120) cm tall, robust perennials, often forming large tough leafy tussocks; leaf blades cauline; sheaths usually bearded with long hairs on the margins and summit.  
 12. Panicles 10–45 cm long, the branches naked near the base; pedicels 0.5–2 mm long, usually erect, spreading ..... *S. airoides*  
 12. Panicles 20–60 cm long, the branches densely flowered near the base; pedicels 0.2–0.5 mm long, appressed ..... *S. wrightii*

352. *Sporobolus airoides* (Torr.) Torr. subsp. *airoides*, Pacific Railr. Rep. Parke, Bot. 7: 21. 1856.

FIGURE 227

Densely caespitose perennial. Culms 35–120 (150) cm tall, erect, stout, glabrous below the nodes; base diameter 1–2(3.5) mm wide, rounded; internodes glabrous. Sheaths  $\frac{2}{3}$  to about as long as the internodes above, glabrous, shiny, sometimes with a few long hairs near the summit, these hairs up to 6 mm long; ligules 0.1–0.3 mm; blades (3)10–45(60) cm long, (1)2–5(6) mm wide, flat to involute, glabrous below and scaberulous to scabrous above; margins mostly smooth to scaberulous. Panicles (10)15–45 cm long, 1.5–2.5 cm wide, open, diffuse, subpyramidal, often included in the uppermost sheath; branches 1.5–13 cm long, ascending to widely spreading 30°–90° from culm axis; secondary branches mostly spreading and not floriferous on lower  $\frac{1}{4}$  to  $\frac{1}{3}$ ; pulvini in axils of primary branches glabrous; pedicels 0.5–2 mm long, spreading, glabrous to scabrous. Spikelets 1.3–2.8 mm long, spreading, purplish or greenish; glumes 0.5–2.4(2.8) mm long, lanceolate to ovate, membranous, unequal; lower glume 0.5–1.8 mm long, often appearing without a midvein, the apex acute; upper glume 1.1–2.4(2.8) mm long, apex acute to obtuse; lemmas 1.2–2.5 mm long, ovate, membranous, glabrous, the apex acute; paleas 1.1–2.4 mm long, ovate, membranous, glabrous, the apex acute to obtuse; stamens 3; anthers 1.1–1.8 mm long, yellowish to purplish. Modified caryopses 1–1.4 mm long, ellipsoid, reddish-brown, striate.  $2n = 80$ , 90, 108, 126.

**DISTRIBUTION AND HABITAT.** *Sporobolus airoides* occurs throughout the arid portions of northwestern North America and in Mexico south to Puebla. It is common in dry to sandy gravelly flats or slopes usually associated with alkaline soils, occurring with *Atriplex canescens*, *Larrea tridentata*, and *Distichlis spicata*. In northern Mexico, *S. airoides* is a halophytic species forming the alkali zacaton grasslands where the edaphic effects of a diverse combination of chloride carbonates and sulfates accumulates to form very saline conditions. *Sporobolus airoides* subsp. *regis* (I. M. Johnst.) Wipff & S.D. Jones, known only from Coahuila, differs from the typical subspecies in having elongate rhizomes, pilose sheaths on the lower surface, and panicle branches with a tuft of hairs in the lower axils (Peterson et al., 2004).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** Villa Ahumada, 10–20 Oct 1935, *LeSueur Mex-071* (US); 64 mi SW of Cd. Juárez, N of Guzman near , 14 Sep 1974, *J. Henrickson 14100* (US); 10 mi S of Villa Ahumada along Hwy 45 between Ciudad Juárez and Chihuahua, 1 Aug 1975, maternal [scrub], 1220 m, *G. & L. Davidse 9255* (MEXU). **Ascensión:** 13 km E of Guzman on winding road to Laguna de Santa María, 22 Aug 1972, 1130 m, *F. Chiang, T. Wendt & M.C. Johnston 8800* (MEXU). **Chihuahua:** Rancho Experimental La Campana, en el km 83 de la carr. [hwy] PanAmer. en el tramo [section] Chih.–Juárez, 23 Jul 1988, pastizal [pastureland], *G. Jiménez s/n* (MEXU); Camino el Sauz–Nueva Delicias, 29 Jul 76, maleza en cultivo de pepino & maíz [weeds in cultivated cucumbers and corn], 1550 m, *M.S. González 301* (RELC). **Galeana:** 145 km de Galeana, 8 Aug 1979, pastizal, 1370 m, *M. Siqueiros 290*, 294 (MEXU). **Guerrero:** Santo Tomas on railroad NW of San

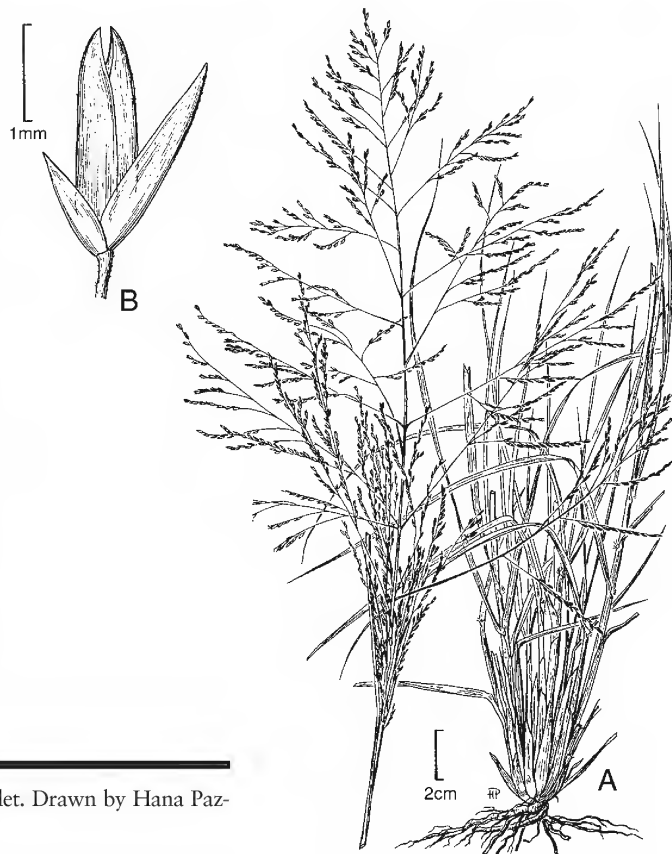


FIGURE 227. *Sporobolus airoides* subsp. *airoides*. A. Habit. B. Spikelet. Drawn by Hana Pazdírková; copyright Utah State University.

Isidro, Sierra Madre Occidental, 18 Sep 1934, grassed prairie, 1950–1960 m, *Pennel 18994* (MEXU). **Ignacio Zaragoza:** 1 km al N of Sta María de Guadalupe on right bank of Río Casas Grandes; 18 Aug 1972, 1250 m, *F. Chiang, T. Wendt & M.C. Johnston 8687* (MEXU). **Janos:** Mexican boundary line near White Water, 11 Sep 1893, *E.A. Mearns 2303* (US); 7 km NE of the town of Janos, below the archeological basaltic hillside of Juanaquena, 4 Sep 1998, *K.R. Adams s.n.* (ARIZ). **Jiménez:** 2 km NW of hacienda el berrendo on las pampas ranch, 25 Aug 1972, mezquital, 1450 m, *F. Chiang, T. Wendt & M.C. Johnston 8857, 8858* (MEXU). **Juárez:** Between Cd. Juárez and Cd. Chihuahua on hwy 45, 28 mi from U.S. border, 7 Aug 1984, matorral, *D. Randolph 160* (MEXU); 4.1 (rd.) mi N of Samalayuca along hwy 45, 13 Sep 1972, Vegetación de dunas [dune vegetation], 4700ft, *J. Henrickson 7451* (MEXU). **Julimes:** Ca. 5 km SE of Sierra del Roque, ca. 20 km by winding road N of Julimes, 19 Jun 1973, deteriorated grassland, 1300 m, *M.C. Johnston, T.L. Wendt & F. Chiang 11377* (MEXU). **Meoqui:** Meoqui, 24 Aug 1935, *LeSueur Mex-034* (US).

353. *Sporobolus alterniflorus* (Loisel.) P. M. Peterson & Saarela. Taxon 63(6): 1236. 2014. *Spartina alterniflora* Loisel., Fl. Gall. 719. 1807.

FIGURE 228

Plants perennial rhizomatous; rhizomes elongate, flaccid, white, scales inflated, not or only slightly imbricate. Culms to 250 cm tall, (0.3)5–15(20) mm thick, erect, solitary or in small clumps, succulent, glabrous, having an unpleasant, sulphurous odor when fresh. Sheaths mostly glabrous, throat glabrous or minutely pilose, lower sheaths often wrinkled; ligules 1–2 mm; blades to 60 cm long, 3–25 mm wide, lower blades shorter than those above, usually flat basally, becoming involute distally, abaxial surfaces glabrous, adaxial surfaces glabrous or sparsely pilose, margins usually smooth, sometimes slightly scabrous, apex attenuate. Panicles 10–40 cm long, with 3–25 spikelike branches, often partially enclosed in the uppermost sheath; spikes 5–15 cm long, loosely appressed, not twisted, more or less equally subremote to moderately imbricate throughout the panicle, axes often prolonged beyond the distal spikelets, with 10–30 sessile spikelets. Spikelets 8–14 mm long, straight, usually divergent, more or less equally imbricate on all the branches; glumes straight, sides usually glabrous, sometimes pilose near the base or appressed-pubescent, hairs to 0.3 mm long; lower glumes 4–10 mm long, acute; upper glumes 8–14 mm long, keels glabrous, lateral veins not present, apex acuminate to obtuse, occasionally apiculate; lemmas glabrous or sparsely pilose, apex usually acuminate; paleas slightly exceeding the lemmas, thin, papery, apex obtuse or rounded; anthers 3–6 mm long.  $2n = 62$

**DISTRIBUTION AND HABITAT.** *Sporobolus alterniflorus* is found on muddy banks, usually along margins of saline lakes or marshes, more commonly along the coast in eastern North and South America (Mobberley, 1956). This species has been cited for Chihuahua in Espejo Serna et al. (2000).

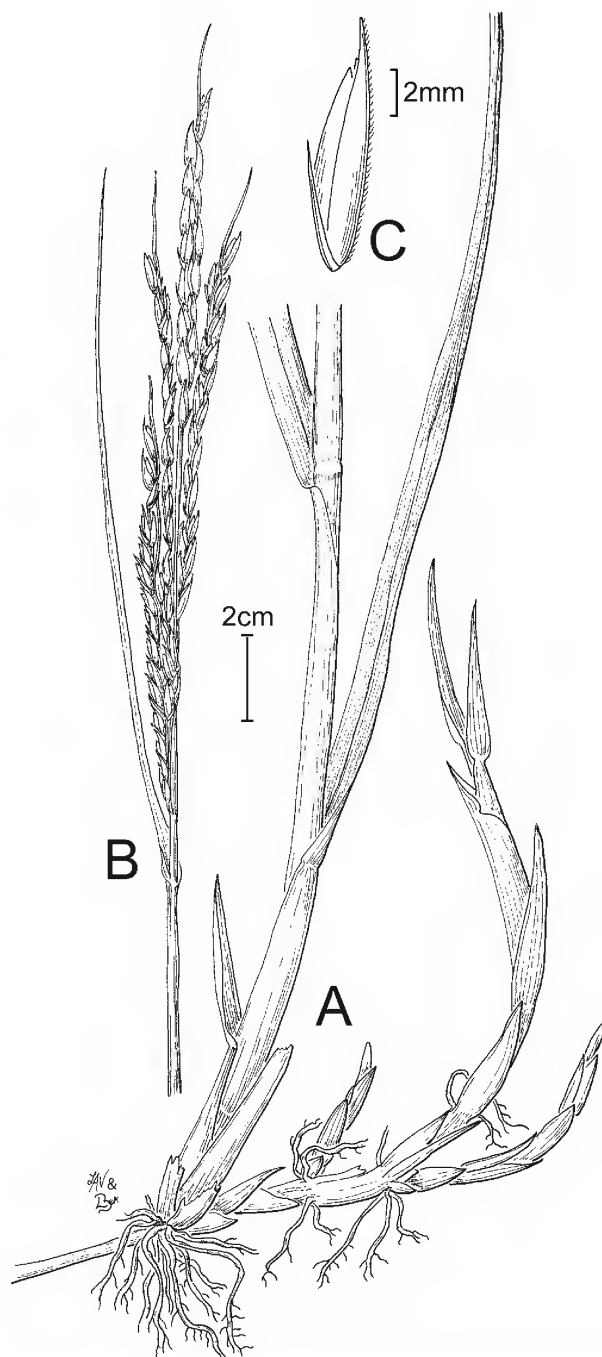


FIGURE 228. *Sporobolus alterniflorus*. A. Habit. B. Inflorescence. C. Spikelet. Drawn by Linda Ann Vorobik and Linda Bea Miller; copyright Utah State University.

354. *Sporobolus contractus* Hitchc., Amer. J. Bot. 2: 303. 1915.

FIGURE 229

Caespitose perennial. Culms 35–100(120) cm tall, erect, glabrous below the nodes, rounded near base, internodes glabrous; base diameter 2–4(5) mm long. Sheaths  $\frac{3}{4}$  to longer than the internodes above, glabrous; margins with ciliate hairs especially on the upper portions, these hairs up to 3 mm long forming a conspicuous tuft near the summit; ligules 0.4–1 mm long; blades (2)4–35 cm long, 3–8 mm wide, flat to involute, glabrous below and above; margins whitish, somewhat scaberulous. Panicles (10)15–45(50) cm long, 0.2–0.8(1) cm wide, narrow, tightly contracted, dense and spikelike, usually included in the uppermost sheath; primary branches 0.3–1.5 cm long, appressed; secondary branches appressed and floriferous to base; pulvini in axils of primary branches glabrous; pedicels 0.2–2 mm long, appressed, scaberulous. Spikelets 1.7–3.2 mm long, whitish to plumbeous; glumes 0.7–3.2 mm long, narrow lanceolate, membranous, unequal, prominently keeled, scaberulous along the keel; lower glumes 0.7–1.7 mm long, rarely without a midvein, the apex acute to acuminate; upper glumes 2–3.2 mm long, the apex acute; lemmas 2–3.2 mm long, linear membranous, glabrous, the apex acute; paleas 1.8–3 mm long, linear-lanceolate, membranous, glabrous, the apex acute; stamens 3; anthers 0.3–0.5 mm long, light yellowish. Modified caryopses 0.8–1.2 mm long, ellipsoid, laterally flattened, light brownish or translucent.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** In Mexico, *S. contractus* ranges from Baja California, Chihuahua, and Sonora to Coahuila and Nuevo León on dry to moist sandy soils, occasionally in salt-desert scrub associated with *Atriplex confertifolia*, *A. canescens*, *Artemisia tridentata* Nutt. and in desert grasslands with pinyon-juniper woodlands at elevations of 300–2,300 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 2 mi N of Gallego, 16 Sep 1960, *Reeder, C. Reeder & Soderstrom* 3490 (ARIZ). **Aldama:** 50 km SW of Coyame of Mex 16 between Presidio, Texas and Chihuahua, 22 Sep 1988, 1400 m, *P.M. Peterson & Annable* 5758 (US). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, *L. H. Harvey* 1397 (US). **Chihuahua:** Chihuahua, 10–20 Oct 1935, *LeSueur* Mex-013, Mex-058 (US); 1 km al E del Rancho el 45, 28 Sep 1973, pastizal [pastureland], 1450 m, *Valdés-Reyna* VR-365 (CIIDIR, ENCB, RELC); 10 km de Chihuahua por carr. [hwy] Chihuahua–Delicias, 27 Jul 1979, pastizal, 1370 m, *M.E. Siqueiros* 143 (MEXU). **Guerrero:** 6 km N Ciudad Guerrero, 02 Dic 1999, pastizal natural, 2000 m, *López S.* 17501 (MEXU). **Jiménez:** 50 km al S de Jiménez, 15 Aug 2010, 1442 m, *D. Ramírez & M.L. Juárez* 3419 (CIIDIR). **Juárez:** carr. No. 2 Juárez–Janos, km 42, 11 Aug 1996, matorral de médanos [dune scrub], 1250 m, *P. Olivas, R. Rivas & I. Enríquez* POS803 (UACJ); 23 km al S del poblado [village] de Samalayuca, por la carr. PanAmer., 9 Sep 1995, 1250 m, *R. Corral & P. Olivas* RCD6347 (UACJ); aprox. 7 km al N del poblado de Samalayuca, a los lados [sides] de la carr., 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5305 (UACJ); 5 km N de Samalayuca, 24 Oct 74, zona de médanos [dune

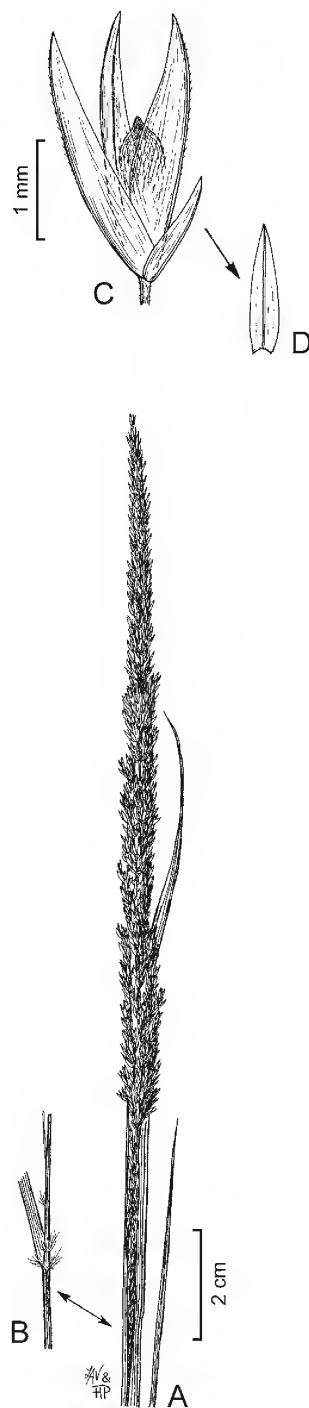


FIGURE 229. *Sporobolus contractus*. A. Inflorescence. B. Portion of culm showing sheath and blade. C. Spikelet. D. Lower glume. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



zone], *J. Valdés-Reyna* VR-777, VR-778 (RELC); Medanos de Samalayuca, 13 Oct 1997, km 70, *I. Enríquez*, *S. Ordoñez* & *J. Leyva* IEA20 (UACJ); 10 km carr. Juárez-Casas Grandes, 24 Oct 74, matorral, 1127 m, *Valdés-Reyna* VR-774 (RELC). **Jiménez:** Reserva de la Biosfera de Mapimí, Laguna Palomas, 31 Oct 1998, matorral xerófilo [xerophilous scrub], 1055 m, *A. García* 3179 (CIIDIR); Costado del Rio Florido, Torreoncitos, 4 Aug 2010, 1330 m, *D. Noya* & *M.L. Juárez* 3401-b (CIIDIR). **Julimes:** Balneario San Diego, 30 Jul 76, pastizal halófito [halophytic grassland], 1190 m, *S. González* & *J.M. Peña* 359 (RELC).

355. *Sporobolus cryptandrus* (Torr.) A. Gray, Manual 576. 1848.

FIGURE 230

Caespitose perennial. Culms 30–100(120) cm tall, erect to decumbent, base flattened to rounded, glabrous below the nodes, internodes glabrous; base diameter 1–3.5 mm wide. Sheaths  $\frac{2}{3}$ – $\frac{3}{4}$  as long as the internodes above, glabrous to scaberulous, sometimes ciliate along the upper margins, summit with a conspicuous tuft of white hairs up to 4 mm long; ligules 0.5–1 mm long; blades (2)5–26 cm long, 2–6 mm wide, flat to involute, mostly glabrous below and scaberulous above; margins scaberulous. Panicles 15–40 cm long, 2–12(14) cm wide, narrowly pyramidal, ultimately open, main axis ascending and straight, lower branches longest, usually included in the uppermost sheath; primary branches 0.6–6 cm long, appressed or ascending, spreading up to 130° from the culm axis; secondary branches mostly appressed not floriferous on lower  $\frac{1}{8}$ – $\frac{1}{4}$ ; pulvini in axils of primary branches ascending, glabrous; pedicels 0.1–1.3 mm long, appressed, glabrous to scaberulous. Spikelets 1.5–2.5(2.7) mm long, brownish, plumbeous or purplish-tinged; glumes 0.6–2.5(2.7) mm long, linear-lanceolate to ovate, membranous, unequal; lower glumes 0.6–1.1 mm long, rarely without a midvein, the apex acute to acuminate; upper glumes 1.5–2.7 mm long, the apex acute; lemmas 1.4–2.5(2.7) mm long, ovate to lanceolate, membranous, glabrous, the apex acute; paleas 1.2–2.4 mm long, lanceolate, membranous, glabrous, the apex acute; stamens 3; anthers 0.5–1 mm long, yellowish to purplish. Modified caryopses 0.7–1.1 mm long, ellipsoid, light brownish to reddish-orange.  $2n = 36, 38, 72$ .

**DISTRIBUTION AND HABITAT.** In Mexico, *S. cryptandrus* ranges from Baja California, Chihuahua, and Sonora to Coahuila, Nuevo León, and Tamaulipas. This species is found on sandy soils, rocky slopes, washes, calcareous ridges, and roadsides in salt-desert scrub with *Atriplex* spp. and *Lycium*, pinyon-juniper woodlands, yellow pine forests, and grasslands at elevations of 60–2,900 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** Camino a Presidio Texas, 2 km al E de carr. [hwy] Panamericana, 24 Oct 74, *Valdés-Reyna* VR-771 (RELC). **Ascensión:** Por la carr. a Palomas, justo al N del entronque [junction] con la carr. a casas Grandes, 11 Jun 2005, 1183 m, *R. Corral*,



FIGURE 230. *Sporobolus cryptandrus*. A. Habit. B. Glumes. C. Floret. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

*M. Vargas & H. Gutiérrez RCD7129 (UACJ)*. **Camargo:** Rancho la Urraca, acceso [access] de Camargo hacia [toward] Ojinaga, desviar hacia [divert toward] Hércules por terracería [dirt road], aprox. 60 km tomar a la izquierda [take left] 30 km, 20 Oct 2000, Matorral [scrub], *G. Gómez 562 (MEXU)*. **Chihuahua:** near Chihuahua, 4 Oct 1885, *C.G. Pringle 419 (US)*; camino [road] El Saúz–Nuevo Delicias, 27 Sep 76, maleza en cultivo de Pepino & maíz [weeds in cultivated cucumber and corn], 1550 m, *S. González & J.M. Peña 309 (RELC)*; Rancho La Gregoria, 15 Oct 1981, matorral, 1400 m, *E. Blanco 1710-A (MEXU)*. **Delicias:** Col. Vicente Guerrero, 26 Jul 1988, planicies pedregosas [private property], 2450 m, *M. Carrasco 10 (MEXU)*. **Jiménez:** Near la Reserva de la Biosfera de Mapimí, 15 Sep 83, Dunas, *Ruíz de Esparza 371 (RELC)*; 5 km al N de Samalayuca, 24 Sep 74, zona de médanos [dune zone], 1270 m, *Valdés-Reyna VR-777 (RELC)*; Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, *D. Noya & M.L. Juárez 3404 (CIIDIR)*.

356. *Sporobolus flexuosus* (Thurb. ex Vasey) Rydb., Bull. Torrey Bot. Club 32: 601. 1905.

FIGURE 231

Caespitose perennial; rarely appearing annual. Culms 30–100(120) cm tall, erect to decumbent, base flattened to rounded, glabrous below the nodes and on internodes; base diameter 1–3 mm wide. Sheaths  $\frac{2}{3}$ – $\frac{3}{4}$  as long as the internodes above, glabrous to scaberulous, sometimes ciliate along the upper margins, summit with a tuft of hairs up to 4 mm long; ligules 0.5–1 mm long; blades (2)5–24 cm long, 2–4(6) mm wide, flat to involute, mostly glabrous below and scaberulous to scabrous above; margins scaberulous. Panicles 10–30 cm long, 4–12 cm wide, open, subovate to oblong, the main axis flexuous and drooping, lower branches no longer than those in the middle, usually with the base included in the uppermost sheath; primary branches 1–8(12) cm long, widely spreading to reflexed, flexuous and tangled, mostly spreading  $70^{\circ}$ – $130^{\circ}$  from the culm axis; secondary branches widely spreading not floriferous on lower  $\frac{1}{8}$ – $\frac{1}{2}$ ; pulvini in the axils of primary branches recurved, pubescent; pedicels 0.3–3 mm long, mostly spreading, scaberulous. Spikelets 1.8–2.5 mm long, plumbeous, the apex acute; glumes 0.9–2.5 mm long, ovate, membranous, unequal; lower glumes 0.9–1.5 mm; upper glumes 1.4–2.5 mm; lemmas 1.4–2.5 mm long, lanceolate to ovate, membranous, glabrous; paleas 1.4–2.4 mm long, ovate, membranous, stamens 3; anthers 0.4–0.7 mm long, yellow. Modified caryopses 0.6–1 mm long, ellipsoid, light brownish to reddish-orange.  $2n = 36, 38$ .

**DISTRIBUTION AND HABITAT.** In Mexico, *S. flexuosus* occurs in Chihuahua, Coahuila, and Sonora on sandy to gravelly slopes, flats, and roadsides in desert scrub with *Atriplex* spp., *Larrea tridentata*, and *Lycium*, plains grasslands, piñon–juniper woodlands, and yellow pine forests at elevations of 760–2,100 m.

**SPECIMENS EXAMINED.** MÉXICO. Chihuahua. **Ahumanda:** 5 km al N de Samalayuca, 24 Oct 74, Médanos

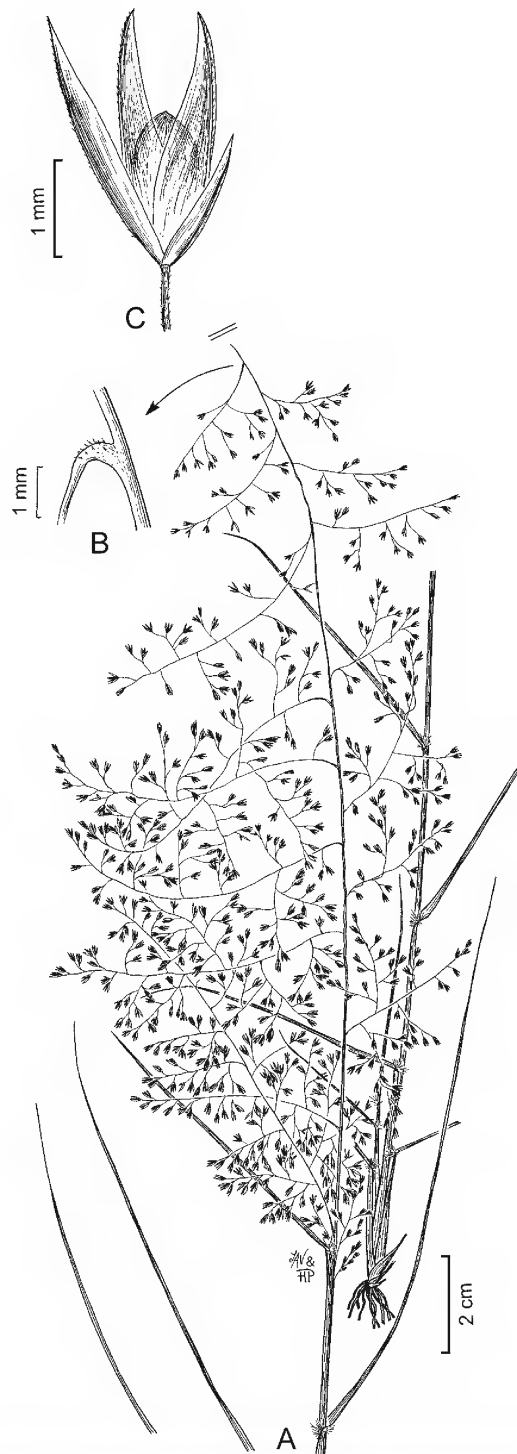


FIGURE 231. *Sporobolus flexuosus*. A. Habit. B. Pulvinus. C. Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

[dunes], 1270 m, *Valdés-Reyna* VR-779 (RELC); 1 km al N del Rancho Santa Fé, 18 Oct 74, Zona de Médanos, 1400 m, *Valdés-Reyna* VR-650 (RELC). **Casas Grandes:** Col. Díaz, 20–21 Sep 1899, *E. W. Nelson* 6458 (US). **Jiménez:** Reserva de la Biosfera de Mapimí, dunas de arena [sand dunes] Ejido La Soledad, 31 Aug 1997, pastizal [pastureland], 1140 m, *A. García* 2768 (CIIDIR). **Juárez:** 30 km al N de Samalayuca, 23 Oct 74, suelo muy arenoso [very sandy soil], 1200 m, *Valdés-Reyna* VR-763 (RELC); Sand Dunes, 10–20 Oct 1935, *LeSueur Mex-080* (MEXU); 4.1 (rd.) mi N of Samalayuca along Hwy 45, 13 Sep 1972, Vegetación de dunas [dune vegetation], 4700ft, *J. Henrickson* 7452 (MEXU); Sand Hills near of Paso del Norte, 28 Sep 1886, *C. G. Pringle* 815 (MEXU, US).

357. *Sporobolus giganteus* Nash, Bull. Torrey Bot. Club 25: 88. 1898.

FIGURE 232

Robust perennial. Culms 100–200 cm tall, erect, stout, glabrous below the nodes, base rounded, internodes glabrous; base diameter (3)4–10 mm wide. Sheaths longer than the internodes above, glabrous, striate, margins with ciliate hairs especially on upper portions, these hairs up to 2 mm long forming a conspicuous tuft near the summit; ligules 0.5–1.5 mm long; blades 10–50 cm long, (3)4–10(13) mm wide, flat, glabrous below and above; margins whitish, scaberulous. Panicles 25–75 cm long, 1–4 cm wide, narrow, contracted, dense and spikelike, usually included in the uppermost sheath; primary branches mostly 0.5–6 cm long, appressed to spreading up to 30° from the culm axis; secondary branches appressed and floriferous to base; pulvini in axils of primary branches glabrous; pedicels 0.5–2 mm long, appressed. Spikelets 2.6–3.5(4) mm long, whitish to plumbeous; glumes 0.6–3.5 mm long, narrow lanceolate, membranous, unequal, prominently keeled, somewhat scaberulous along the keel; lower glumes 0.6–2 mm long, the apex acute to acuminate; upper glumes 2–3.5(4) mm long, the apex acute; lemmas 2.5–3.5(4) mm long, linear-lanceolate, membranous, glabrous, the apex acute; paleas 2.4–3.4(3.8) mm long, linear-lanceolate, membranous, glabrous, the apex acute; stamens 3; anthers 0.6–1 mm long, yellowish. Modified caryopses 0.8–1.7 mm long, ellipsoid, light yellowish-brown sometimes translucent.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Sporobolus giganteus* grows in sand dunes, sandy areas along rivers, calcareous slopes, and roadsides associated with *Acacia constricta*, *Larrea tridentata*, *Jatropha dioica*, *Juniperus*, and *Atriplex canescens* at 760–1,220 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** ca. 67.7 km S of Juárez on Mex 45, 7 Sep 1989, grassland, 1800 m, *P. M. Peterson & Annable* 7935 (ENCB, US); 10 km al S de Moctezuma, 30 Jul 1994, 1200 m, *R. Corral, E. Pérez, A. Domínguez & F. Félix* RCD5351 (UACJ). **Juárez:** Al W de la Sierra Juárez, 1 km al W de El Parabién, 27 Aug 1997, matorral de dunas arenosas [sand dune scrub], Izotal con mezquite, 1200 m, *A. Aquino* AA67 (UACJ); Area of high sand dunes 5 km N of



FIGURE 232. *Sporobolus giganteus*. A. Culm and Inflorescence. B. Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

Samalayuca on the Juárez hwy, 28 Oct 1972, desiertos arenosos [sandy deserts], 1250 m, T.L. Wendt, F. Chiang & M.C. Johnston 9926 (MEXU); Area of high sand dunes 8 km N of Samalayuca on the Juárez hwy, 28 Oct 1972, desiertos arenosos, 1300 m, T.L. Wendt, F. Chiang & M.C. Johnston 9937A (MEXU); Sand Dunes, 11 Dic 1935, *LeSueur Mex-013* (MEXU); 4.1 (rd.) mi N of Samalayuca along Hwy 45, 13 Sep 1972, Vegetación de dunas [dune vegetation], 4700 ft, J. Henrickson 7427 (MEXU).

358. *Sporobolus indicus* (L.) R. Br., Prodr. 170. 1810.

FIGURE 233

Caespitose perennial or at least long-living annual with tough fibrous roots. Culms 30–100(120) cm tall, erect, base mostly flattened, glabrous below the nodes, internodes glabrous; base diameter 1–3.5(5) mm wide. Sheaths  $\frac{1}{2}$  to about as long as the internodes, glabrous; ligules 0.2–0.5 mm long; blades (6)10–30(50) cm long, 1–5 mm wide, flat, glabrous below and above. Panicles 20–35(50) cm long, 0.3–2.2(3) cm wide, narrow, contracted, sometimes included in the uppermost sheath; primary branches mostly 0.4–2.5(5) cm long, appressed sometimes ascending spreading up to 40° from the culm axis; secondary branches appressed and floriferous to base; pulvini in axils of primary branches glabrous; pedicels 0.1–1.8 mm long, appressed. Spikelets 2.0–2.6(2.7) mm long, plumbeous to light brownish; glumes 0.4–1.6 mm long, ovate or obovate, membranous, subequal; lower glumes 0.3–1 mm long, often without a midvein, the apex acute, obtuse to truncate, often erose; upper glumes 0.6–1.6 mm long, the apex acute obtuse to truncate, often erose; lemmas 1.4–2.6(2.7) mm long, ovate, membranous, glabrous, the apex acute or obtuse; paleas 1.3–2.4 mm long, ovate, membranous, glabrous, the apex acute; stamens 3; anthers 0.5–1.1 mm long, white, sometimes purple-tinged. Modified caryopses 0.6–1.2 mm long, ellipsoid-quadrate, truncate toward apex, flattened laterally, reddish brown.  $2n = 18, 24, 36$ .

**DISTRIBUTION AND HABITAT.** *Sporobolus indicus* is found throughout the Western Hemisphere and is common in disturbed places, open areas, roadsides, and pastures and along lake shores and beaches in sandy or clay soils associated with many plant communities at elevations of 3–2,460 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Batopilas:** Yamuco, 1 mi E of hwy N of Rio Urique crossing towards Basihuare and Creel, 6 Sep 2008, P.M. Peterson & J.M. Saarela 22056 (US); Yamuco at 1 km E of hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, pine forest, 1891 m, P.M. Peterson & P. Catalán 17541 (US); SW Chihuahua, Aug 1885, E. Palmer 29 (US). Bocoyna: 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22025 (US). **Guachochi:** Just N of Guachochi (1 km), 26 Sep 1988, pine forest, 2500 m, P.M. Peterson & Annable 5922 (ENCB, US); 37.4 km S of Creel on road to Batopilas, 10 Sep 1989, pine forest, 2045 m, P.M. Peterson, Annable & Y. Herrera 8013 (ENCB, US); small spring below Napuchis, 2 Sep 2003, pine forest, 1950 m, P.M. Peterson & P. Catalán 17654 (CIIDIR); 24.6



FIGURE 233. *Sporobolus indicus*. A. Habit. B. Spikelet. Drawn by Hana Pazdírková; copyright Utah State University.

km W of Guachochi and 0.6 km S of Rocheachi, 2340 m, P.M. Peterson, Annable & Valdés-Reyna 10795 (US); 1–2 km S of Rio Osichi and Rio Basihuare jct, 1 Sep 2003, bosque de encino [oak forest], 1600 m, P.M. Peterson & P. Catalán 17632 (CIIDIR, US); Cusarare, S of Creel, 10 Sep 1973, 2150 m, Bye 5008 (MEXU, NMC); Cusarare along arroyo just NW of Cusarare church, 16 Oct 1977, 2140 m, Bye & W.A. Weber 8178 (MEXU); Near



cusarare S of Creel–La Bufa road arroyo crossing, 11 Aug 1972, occasional in open fields, 7000 ft, *Bye 2741* (MEXU); 5 km antes del entronque [before junction] a la Bufa carr. [hwy] Guachochic–Creel, 4 Sep 1981, pine forest, 2500 m, *M.E. Siqueiros 1625* (MEXU). **Guerrero:** 38.6 km SW of La Junta and approx. 70.8 km N of Creel at P. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable 5853* (ENCB, US); carr. la Junta–San Juanito 17 km, 22 Sep 1997, 2290 m, *B. Tab V. 21* (MEXU); **Tomochi** 2 km alrededor del poblado [around the village], 24 Sep 1997, pine forest, 2100 m, *M.A. Vergara 147* (MEXU); 78 km de la Junta Basaseachic, 10 Oct 1981, bosque esclerófilo caducifolio [deciduous sclerophyllous forest], 1230 m, *R. Fierros 1701* (MEXU). **Ocampo:** Llano de Chabacan, above crossing with Rio La Haciendita, 3 km SE of La Bateria, Rio mayo Region, 29 Aug 1986, 1650 m, *P.S. Martin s.n.* (ARIZ); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King 8225* (US). **Temosachi:** Nabogame, 29 Jul 1987, 1800 m, *Laferr. 586* (MEXU).

359. *Sporobolus pyramidatus* (Lam.) Hitchc., Man. Grasses W. Ind. 84. 1936.

FIGURE 234

Caespitose annual with intravaginal branching at base. Culms 7–35(60) cm tall, erect or decumbent, base rounded, glabrous below the nodes, internodes glabrous; base diameter 1–1.6 mm wide. Sheaths  $\frac{1}{2}$  to almost as long as the internodes above, glabrous or with ciliate hairs on the margins and summit, the hairs up to 3 mm long; ligules 0.3–1 mm long; blades 2–12(20) cm long, 2–6 mm wide, flat, glabrous below and scaberulous above, sometimes with a few hirsute hairs, mostly borne near base; margins ciliate-pectinate. Panicles 4–15(18) cm long, 0.3–6 cm wide, open and pyramidal with verticillate branches spreading  $30^{\circ}$ – $90^{\circ}$ , contracted and narrow when immature; primary branches 0.5–4.5 cm long, not floriferous on the lower  $\frac{1}{3}$ – $\frac{1}{2}$ , lowest branches whorled in verticels of 7–12(15), lower portions of each branch with elongated glands; secondary branches appressed; pedicels 0.1–0.5 mm long, appressed. Spikelets 1.2–1.8 mm long, plumbeous or brownish, often secund along the branch; glumes 0.3–1.8 mm long, ovate to obovate, membranous, unequal; lower glumes 0.3–0.7 mm long, without a midvein, the apex acuminate, obtuse or irregularly truncate; upper glumes 1.2–1.8 mm long, the apex acute or acuminate and sometimes scaberulous; paleas 1.1–1.6 mm long, ovate to elliptic, membranous, the apex acute to obtuse; stamens 3; anthers 0.2–0.4 mm long, yellow or purplish. Modified caryopsis 0.6–1 mm long, obovoid, faintly striate, light brownish.  $2n = 24, 36, 54$ .

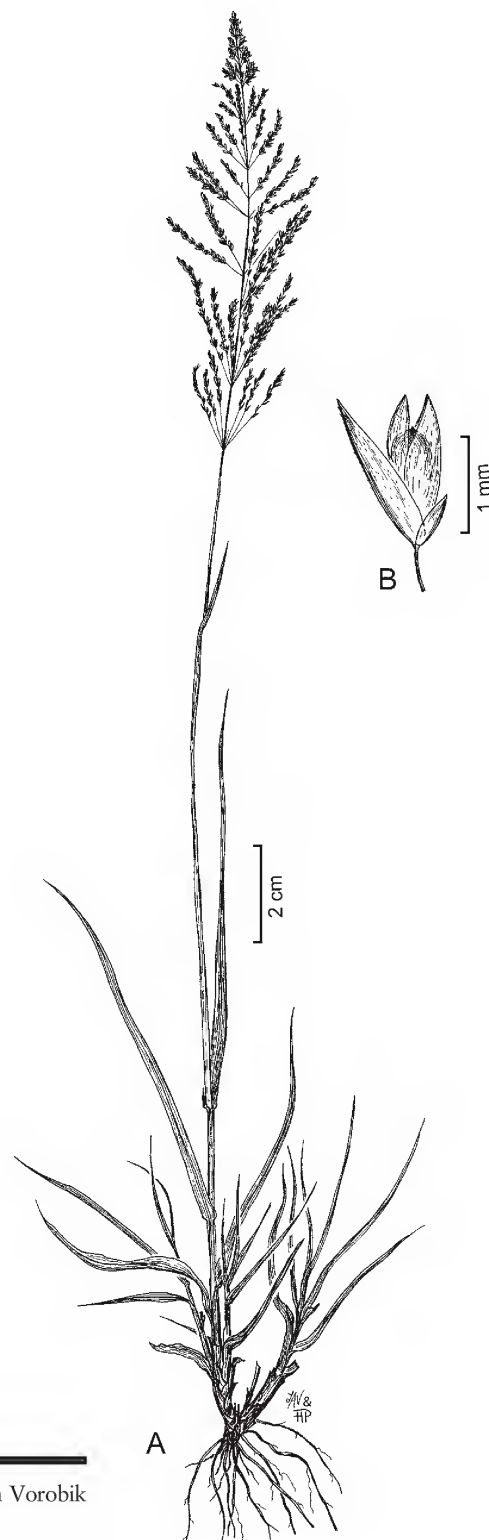


FIGURE 234. *Sporobolus pyramidatus*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.



**DISTRIBUTION AND HABITAT.** *Sporobolus pyramidatus* is common throughout Mexico, occurring on disturbed soils, roadsides and railways, coastal sands, and alluvial slopes in many plant communities at 5–1,750 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** km 26 SW Villa Ahumada, 22 Oct 1954, *Hern.-Xol.* & *C. Tapia* N-77 (US); 44 km al N del poblado [village] Villa Ahumada por la carr. [hwy] PanAmer. (Méx 45), 7 Oct 1995, 1200 m, *R. Corral*, *P. Olivas* & *J.O. Torres* RCD6442 (UACJ); 35 mi N of Moctezuma, 16 Aug 1950, *Reeder*, *C. Reeder* & *L.N. Gooding* 1710 (ARIZ). **Aldama:** Sta María en Valle de Aldama, 15 Sep 1955, *Hern.-Xol.* & *V. Mathus* N-1745 (US). **Ascensión:** 4 mi W of Guzman, 21 Aug 1972, zacaton [grassland] with *Sporobolus* and halofitas [halophytes], 1180 m, *F. Chiang*, *T. Wendt* & *M. C. Johnston* 8782B (MEXU); 13 km E of Guzman on winding road to Laguna de Santa María, 22 Aug 1972, zacatonal, 1130 m, *Chiang*, *T. Wendt* & *M. C. Johnston* 8799 (MEXU); 64 mi SW of Cd. Juárez, N of Guzman near, 14 Sep 1974, with *Prosopis*, *Suaeda*, *Atriplex acanthocarpa*, *A. canescens*, 1200 m, *J. Henrickson* 14097 (MEXU). **Chihuahua:** Rancho La Presa, Chih., 21 Oct 1954, 1100 m, *Hern.-Xol.* & *C. Tapia* N-68 (US); near Chihuahua, 22 Sep 1886, *C.G. Pringle* 816 (US); La Campana, 4 km Ote. [W] carr. Panamericana, 6 Sep 73, lotes de producción de semilla [seed-production lots], 1500 m, *Valdés-Reyna* VR-100 (RELC); El Bajío, 14 km Ote. carr. PanAmer., 25 Aug 73, pastizal [pastureland], 1400 m, *Valdés-Reyna* VR-11 (RELC). **Delicias:** km 13 S of Cd. Delicias, 1 Nov 1954, 950 m, *Hern.-Xol.* & *C. Tapia* N-553 (US). **Gómez Farías:** Laguna de Babicora, Cerro Canoas, 3 Sep 1994, 2400 m, *T. Lebgue*, *G. Quintana* & *E. Estrada* 3234 (NMC); Laguna Babicora, 9 Sep 1994, 2150 m, *G. Quintana* & *E. Estrada* 3514 (NMC). **Jiménez:** Reserva de la Biosfera de Mapimí, Laguna Palomas, 31 Oct 1998, matorral xerófilo [xerophilous scrub], 1055 m, *A. García* 3178 (CIIDIR); El Hugo, Torreoncitos, 13 Aug 2010, bordo de agua [water margins], 1355 m, *D. Ramírez* & *M.L. Juárez* 3390 (CIIDIR); Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, *D. Noya* & *M.L. Juárez* 3403 (CIIDIR). **Juárez:** km 32 Nuevo Casas Grandes–Galeana, 23 Oct 1954, *Hern.-Xol.* & *C. Tapia* N-127 (US); km 2052 rd to Juárez, 82 km S of Cd. Juárez, 21 Oct 1954, *Hern.-Xol.* & *C. Tapia* N-50 (US). **Ojinaga:** 17.5 air km S of Ojinaga on Chihuahua hwy 18, 21 Oct 1990, 1100 m, *Spellenberg*, *M. Mabrt* & *L. Rayburn* 10743 (MEXU); E Chihuahua, about 5.5 mi S of Ojinaga, rd from Ojinaga S to Alamos Chapo, 10 Aug 1941, *I.M. Johnston* 8005 (MEXU, US).

360. *Sporobolus spiciformis* Swallen, Proc. Biol. Soc. Wash. 56: 78. 1943.

FIGURE 235

Caespitose perennial. Culms 30–70 cm tall, erect, mostly glabrous; base diameter 1–1.8 mm wide. Sheaths shorter than the internodes, rounded, striate, scaberrulous, hairy only at the corners; ligules 0.8–1 mm long, densely ciliate; blades 7–20 cm

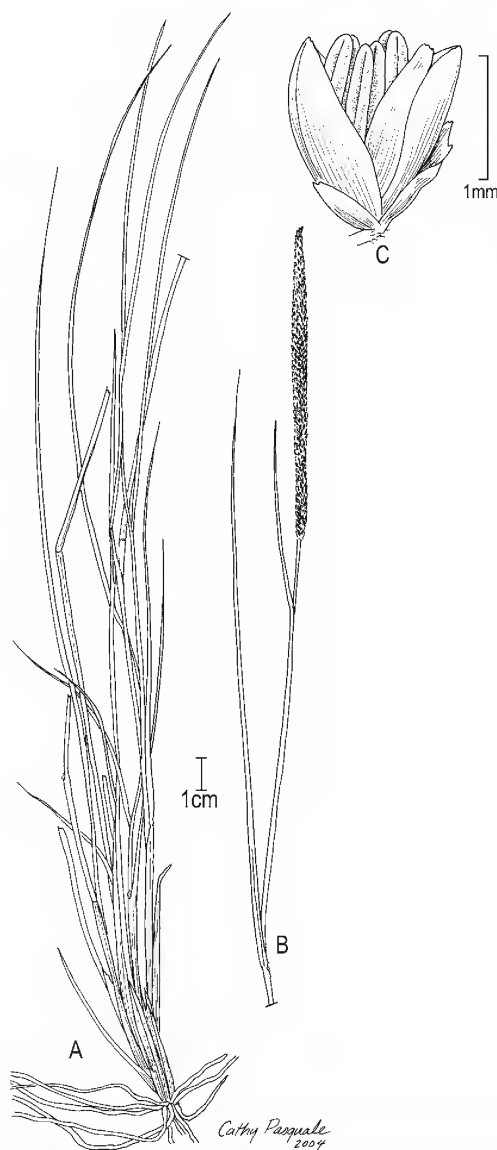


FIGURE 235. *Sporobolus spiciformis*. A. Habit. B. Inflorescence. C. Spikelet. Drawn by Cathy Pasquale for Smithsonian Institution, Department of Botany.

long, 1.5–2 mm wide at the base, flat or becoming involute or at least boat shaped in section, firm, flexuous, adaxial surface with white ridges. Panicles 9–17 cm long, 3–5(10) mm wide, spiciform and spike-like, white, often the lower portion included in the sheath. Spikelets 1.6–2.3 mm long; glumes 0.8–1.8 mm long, unequal, hyaline, the apex obtuse to acute, minutely erose; lower glumes 0.8–1.2 mm long; upper glumes 1–1.8 mm long,

1-veined; lemmas 1.6–2.3 mm long, the apex obtuse to acute, minutely erose; paleas 1.6–2.3 mm long, the apex minutely 2-toothed; anthers 1–1.3 mm long, yellow. Modified caryopses 0.8–1 mm long, ellipsoid.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Sporobolus spiciformis* is endemic to the Chihuahuan Desert Region, reported from Chihuahua, Coahuila, and Nuevo León, where it is restricted to saline or gypsum-derived soils associated with *Yucca*, *Ephedra*, *Nama*, *Suaeda*, *Chilopsis linearis*, and *Prosopis*; at 410–1,750 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Jiménez: Reserva de la Biosfera de Mapimí, 1 km de Las Palomas, 6 Jul 1997, matorral xerófilo [xerophilous scrub], 1055 m, A. García 2638 (CIIDIR, MEXU).

**361. *Sporobolus trichodes* Hitchc., Contr. U.S. Natl. Herb. 17(3): 311. 1913.**

Perennial; caespitose. Culms erect; slender; 20–60 cm long; wiry. Leaves mostly basal; sheaths persistent and investing base of culm with fibrous dead sheaths; ligules 3–5 mm long, fringe of hairs, pilose-membranose; blades 5–10 cm long, 1–2 mm wide, involute. Panicle 5–10 cm long, 5–10 cm wide, open, ovate, effuse; branches capillary, spreading. Spikelets 2.5–3(4) mm long, solitary, bisexual; pedicels filiform, flexuous, with 1 fertile floret; florets 1.5–2 mm long, lanceolate, subterete, purple or brown; disarticulating below each fertile floret; glumes shorter than spikelet,  $\frac{1}{2}$  as long as the adjacent fertile lemma, membranous, deciduous; lower glumes 0.6–0.7 mm long, lanceolate, without keels, 1-veined, apex acute; upper glume 0.7–1 mm long, ovate, without keels, 1-veined, apex acute; fertile lemmas 1.5–2 mm long, ovate, membranous, light brown or purple, without keels, 1-veined, apex acute; palea similar to lemma, 2-veined, keels approximate; stamens 3; anthers 1–1.1 mm long, purplish. Modified caryopses about 1 mm long.

**DISTRIBUTION AND HABITAT.** *Sporobolus trichodes* is a Mexican endemic widely distributed in Aguascalientes, Chihuahua, Guanajuato, Guerrero, Jalisco, México, Michoacán, Morelos, Veracruz, and Zacatecas.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. Balleza: 24.2 km W of Balleza on Mex 127 towards Guachochi, 13 Sep 1989, pine forest, 2380 m, P.M. Peterson, Annable & Y. Herrera 8088 (ENCB, US); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza, 18 Sep 1991, pine-oak, 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10699 (CIIDIR, US). Guerrero: near Guerrero, 9 Sep 1887, C.G. Pringle 1426 (US).

**362. *Sporobolus wrightii* Munro ex Scribn., Bull. Torrey Bot. Club 9: 103. 1882.**

FIGURE 236

Densely caespitose perennial. Culms 90–250 cm tall, erect, stout, glabrous below the nodes, base rounded, internodes glabrous; base diameter 2–9 mm wide. Sheaths  $\frac{2}{3}$  to a little longer than the internodes above, glabrous, shiny, rarely with a few



FIGURE 236. *Sporobolus wrightii*. A. Habit. B. Spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

long hairs near the summit, these hairs up to 6 mm long; ligules 1–2 mm long; blades 20–70 cm long, 3–10 mm wide, flat rarely involute, glabrous below and scabrous above; margins scabrous roughened. Panicles 20–60 cm long, 12–26 cm wide, open, broadly lanceolate, exserted; primary branches 1.5–10 cm long, ascending to widely spreading  $20^{\circ}$ – $70^{\circ}$  from the culm axis; secondary branches appressed and floriferous to base; pulvini in axils of primary branches glabrous; pedicels mostly 0.2–0.5 mm

long, appressed. Spikelets 1.5–2.5 mm long, crowded and appressed, purplish or greenish; glumes 0.5–2 mm long, lanceolate to ovate, membranous, unequal; lower glumes 0.5–1 mm long, often appearing without a midvein, the apex acute; upper glumes 0.8–2 mm long, the apex acute to obtuse; lemmas 1.2–2.5 mm long, ovate, membranous, glabrous, the apex acute to obtuse; paleas 1.1–2.5 mm long, ovate, membranous, glabrous, the apex acute to obtuse; stamens 3; anthers 1.1–1.3 mm long, yellowish to purplish. Modified caryopses 1–1.4 mm long, ellipsoid, reddish-brown or blackish, striate.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Sporobolus wrightii* grows in moist clay flats and rocky slopes near saline habitats associated with *Atriplex*, *Acacia*, *Suaeda*, *Prosopis*, and *Opuntia* at elevations of 5–1,800 m.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 11 km al N de Villa Ahumada Chihuahua km 98 carr. [hwy] Chihuahua–Cd Juárez, 13 Sep 1978, 1120 m, Valdés-Reyna, R. Grether & H. Quero s.n. (MEXU). **Ascensión:** alrededores del cruce [near the crossing] del río Casas Grandes con la carr. Juárez–Ascensión, 11 Jun 2005, 1180 m, R. Corral, M. Vargas & H. Gutiérrez RCD7143 (UACJ). **Camargo:** 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, L. H. Harvey 1382 (US); entre [between] los Ángeles & Jaco, 3 Aug 1976, matorral [scrub], 1265 m, J.M. Peña & S. González 499 (RELC). **Casas Grandes:** near Casas Grandes, 30 Aug 1899, E.W. Nelson 6344 (US). **Chihuahua:** Rancho La Gregoria, 15 Oct 1982, matorral, 1400 m, E. Blanco 1707 (MEXU). **Ignacio Zaragoza:** 1 km N of rancho Santa María de Guadalupe on right bank of rio Casas Grandes, 18 Aug 1972, 1250 m, F. Chiang, T. Wandt & M.C. Johnston 8688 (MEXU). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1460 m, L. H. Harvey 1606 (US); 7 km NE of the town of Janos, at the archaeological site of Juanaquena, 4 Sep 1988, K.R. Adams s.n. (ARIZ). **Jiménez:** 10 km E of Cd. Jiménez, 31 Jul 1939, L. H. Harvey 1350 (US); Costado del Rio Florido, Torreoncitos, 4 Aug 2010, 1330 m, D. Noya & M.L. Juárez 3405 (CIIDIR). **Juárez:** Medanos de Samalayuca, 13 Oct 1997, km 70, I. Enríquez, S. Ordoñez & J. Leyva IEA19 (UACJ). **Julimes:** Baños de San Diego, 12 Aug 1975, J.M. Peña JMP-159 (RELC). **Madera:** between Col. García and Pratt's Rancho below Pacheco, 22–24 Aug 1899, E.W. Nelson 6243 (US). **Manuel Benavides:** E Chihuahua, vicinity of Pirámide, 12 Aug 1941, I.M. Johnston 8034, 8139 (MEXU), 8139 (MEXU, US). **Meoqui:** In town of Meoqui, along hwy 45, SE of city of Chihuahua, 25 Sep 2004, 1140 m, R.M. King & R.M. Garvey 13463 (CIIDIR). **Ojinaga:** km 10 carr. Ojinaga–Camargo, 18 Aug 74, matorral, 1200 m, Valdés-Reyna VR-580 (RELC).

### *Stenotaphrum* Trin.

Annual or perennial; sometimes rhizomatous or stoloniferous. Culms usually compressed; internodes solid. Leaves cauline; sheaths shorter than the internodes, compressed; ligules membranous and ciliate or of hairs; blades flat or folded. Inflorescences

spikelike panicles; branches very short, with fewer than 10 spikelets, appressed to and partially embedded in the flattened, corky rachises; disarticulation below the glumes, often with a segment of the branch. Spikelets lanceolate to ovate, unawned, lower glumes oriented away from the branch axes; glumes membranous; lower glumes scalelike, usually without veins; upper glumes 5- to 7-veined; lower florets staminate or sterile, lemmas 3- to 9-veined; upper florets bisexual; upper lemmas longer than the glumes, papery to subcoriaceous, 3- to 5-veined; upper paleas generally indurate, 2-veined; anthers 3. Caryopsis lanceolate to ovate, often failing to develop.  $x = 9$ .

*Stenotaphrum* is a genus of seven species that usually grow on the seashore or near the coast, primarily along the rim of the Indian Ocean. Three species are endemic to Madagascar, and *S. secundatum*, although thought to be introduced to Mexico, is probably native to the southeastern United States (Sauer 1972).

363. *Stenotaphrum secundatum*\* (Walter) Kuntze, Revis. Gen. Pl. 2: 794. 1891.

Plants stoloniferous. Culms 10–30 cm tall, decumbent, rooting at the lower nodes, branched above the base, with prominent prophylls. Sheaths sparsely pilose, constricted at the summit; ligules about 0.5 mm long, membranous, ciliate; blades 3–15(18) cm long, 4–10 mm wide, thick, flat, glabrous, apex blunt. Panicles 4.5–10 cm long, less than 1 cm wide; rachises flattened, winged; branches 12–20, with 1–5 spikelets. Spikelets 3.5–5 mm long, partially embedded on 1 side of the branch axes; lower glumes about 1 mm long, rounded, irregularly toothed; upper glumes and lower lemmas 3–4 mm, about equal; upper lemmas papery, 5-veined, margins weakly clasping the paleas; anthers 2–2.5 mm long, tan or purple. Caryopsis about 2 mm long, oblong to obovate.  $2n = 18$ .

**DISTRIBUTION AND HABITAT.** *Stenotaphrum secundatum* grows at the edges of swamps and lagoons and along inland streams and lakes. It is known from Aguascalientes, Chiapas, Chihuahua, Jalisco, Morelos, Puebla, Quintana Roo, and Tabasco. This species has been reported from Chihuahua (Espejo Serna et al., 2000).

### *Thinopyrum* Á. Löve

Perennial; caespitose or not, sometimes rhizomatous. Culms usually erect. Sheaths glabrous or ciliate; auricles present or absent; ligules membranous; blades convolute or flat. Inflorescences terminal, distichous spikes, usually not disarticulating at maturity; disarticulation usually beneath the florets and tardy, occasionally in the rachises. Spikelets 1–3 times the length of the middle internodes, solitary, appressed to ascending, often arching outward at maturity; glumes oblong to lanceolate, stiff and thick, indurate to coriaceous, glabrous or with hairs, keeled or rounded at the base, usually more strongly keeled distally than below, margins often with a hyaline margin, apex truncate to acute, sometimes mucronate, unawned, without lateral teeth; lemmas 5-veined, stiff, thick and coriaceous, glabrous or

with hairs, truncate, obtuse, or acute, sometimes mucronate or awned, awns to 3 cm; anthers 3.  $\times = 7$ .

*Thinopyrum* includes seven species, most of which are alkaline tolerant. It is native from the Mediterranean region to western Asia.

364. *Thinopyrum intermedium*\* (Host) Barkworth & D. R. Dewey, Amer. J. Bot. 72(5): 772. 1985.

*Agropyron barbulatum* Schur., Verh. Mith. Siebenburg. Vereins Naturwiss. Hermannstadt 4: 91. 1853.

FIGURE 237

Plants rhizomatous, often glaucous. Culms 52–115 cm tall, glabrous or hairy, sometimes hairy only on the nodes, lowest internode plus sheath about 3 mm thick. Sheaths mostly glabrous, often ciliate on the margins; auricles 0.5–1.3 mm long; ligules 0.1–0.8 mm long; blades 2–8 mm wide, flat, abaxial surfaces glabrous, adaxial surfaces usually sparsely strigose, sometimes also with shorter pubescence, margins whitish, thicker than the veins. Spikes 8–21 cm long, erect or lax; middle internodes 7–12 mm long; rachises pubescent, not disarticulating at maturity. Spikelets 11–18 mm long, with 3–10 florets; glumes oblong, weakly keeled distally, glabrous and mostly smooth or strigose with 1–1.5 mm long hairs, hairs usually evenly distributed, keels scabrous, at least distally, midvein usually more prominent and longer than the lateral veins, margins not hyaline or hyaline near the apex, apex obliquely truncate or obtuse to acute, sometimes mucronate; lower glumes 4.5–7.5 mm long, 1.5–2.5 mm wide, 5- or 6-veined; upper glumes 5.5–8 mm long, 2–3 mm wide, 5- to 7-veined; lowest lemmas 7.5–10 mm long, glabrous or with 1–1.5 mm long hairs, hairs usually evenly distributed, sometimes only on the outer portion of the lemmas, apex occasionally awned, the awns to 5 mm long; paleas 7–9.5 mm long, keels usually ciliate on upper  $\frac{1}{2}$ ; anthers 5–7 mm long.  $2n = 42, 43$ .

**DISTRIBUTION AND HABITAT.** *Thinopyrum intermedium* is native to Europe and western Asia. It is one of the most common species of the genus and is widely introduced in western North America for erosion control, revegetation, forage, and hay. One of its advantages for erosion control and revegetation is that it establishes itself rapidly in many different habitats.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** La Campana, 24 Sep 76, Jardines de Observación Forrajera [forage observation garden], 1500 m, S. Gonzalez 771 (RELC). **Práxedes G. Guerrero:** Rancho Escuela, 18 Oct 1997, I. Enriquez, S. Ordoñez, L. Sushii, S. Carrasco, A. Perales & N. Loya IEA10 (UACJ).

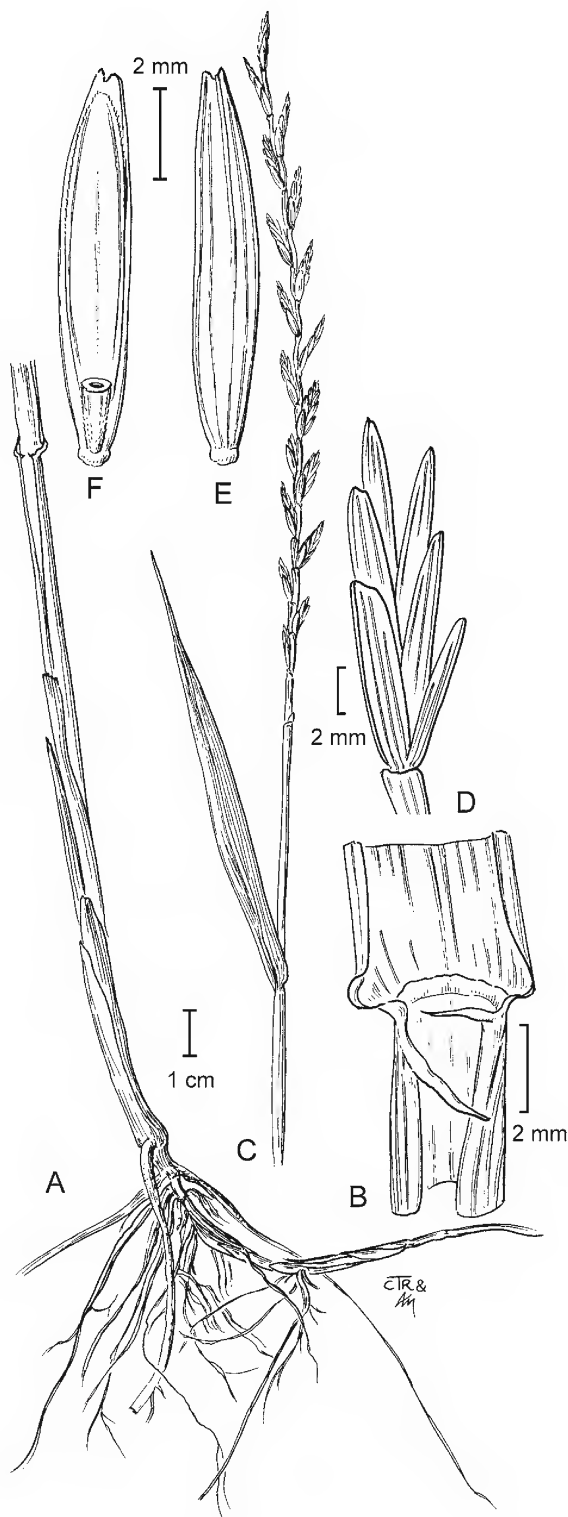


FIGURE 237. *Thinopyrum intermedium*. A. Base of culm. B. Ligule with auricles. C. Inflorescence. D. Spikelet. E. Floret, dorsal view. F. Floret, ventral view. Drawn by Cindy Roché and Annaliese Miller; copyright Utah State University.

### *Trachypogon* Nees

Annual or perennial; caespitose or short rhizomatous. Culms unbranched; internodes semi-solid. Leaves cauline, not aromatic; sheaths shorter than the internodes, rounded; ligules membranous; blades flat to involute. Inflorescences terminal, solitary racemes of heterogamous subsessile-pedicellate spikelet pairs (rarely of 2 digitate spikelike branches), axes slender, without a translucent median groove; disarticulation beneath the pedicellate spikelets. Subsessile spikelets staminate or sterile, without a callus and unawned, otherwise similar to the pedicellate spikelets. Pedicels slender, not fused to the rames axes. Pedicellate spikelets bisexual; calluses sharp, strigose; glumes firm, enclosing the florets; lower glumes several-veined, encircling the upper glumes; upper glumes 3-veined; lower florets sterile; upper florets bisexual, lemmas firm but hyaline at the base, tapering to an awn; awns twisted, pubescent to plumose; paleas absent; anthers 3.  $x = 10$ .

*Trachypogon* is a tropical or warm-temperate genus of four species that is native to Africa and tropical to subtropical America.

365. *Trachypogon spicatus* (L. f.) Kuntze, Revis. Gen. Pl. 2: 794. 1891. *Stipa spicata* L. f., Suppl. Pl. 111. 1781.

*Trachypogon secundus* (J. Presl) Scribn.

*Trachypogon plumosus* (Humb. & Bonpl. ex Willd.) Nees.

Perennial. Culms 60–120 cm long, erect; nodes appressed-hirsute. Sheaths sparsely appressed-pilose; ligules 2–5 mm long, stiff, acute; blades usually 12–35 cm long, 3–8 mm wide, with a broad midrib. Racemes 10–18 cm long, the internodes glabrous. Pedicellate spikelets 6–8 mm long; glumes pilose; awns 4–6 cm long, pilose below, the hairs 1–2 mm long, nearly glabrous distally; anthers 4–5 mm long, orange.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Trachypogon spicatus* is found in sandy prairies, woodlands, rocky hills, and canyons in well-drained soils.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 16.1 km W of Balleza and 77.9 km E of Guachochi, 18 Sep 1991, oak forest, 1990 m, *P.M. Peterson, Annable & Valdés-Reyna 10746* (CIIDIR, US); 43.5 km W of Balleza and 51.6 km E of Guachochi, 18 Sep 1991, pine forest, 2320 m, *P.M. Peterson, Annable & Valdés-Reyna 10755* (CIIDIR, US). **Batopilas:** Yamuco at 1 km E of hwy towards Basihuare and Creel, N of Rio Urique crossing, 26 Aug 2003, bosque de pino [pine forest], 1891 m, *P.M. Peterson & P. Catalán 17535* (US); SW Chihuahua, Aug 1885, *E. Palmer 26* (US). **Chinipas:** Saguarivo, 53 mi N of Alamos, 9 Sep 2008, slopes with oaks and pines, 1540 m, *P.M. Peterson & J.M. Saarela 22124* (US). **Chihuahua:** near Chihuahua, 19 Aug 1885, *C.G. Pringle 495* (US); 3 Sep 1935, *LeSueur Mex-015* (US); 87 km N of Chihuahua, 1 km S of Arco iris on hwy 45, 5 Oct 1986, grassland, *Spellenberg, Soreng & R. Corral 8900* (CIIDIR); 87 km N Chihuahua 1 km S Arco Iris on Hwy 45, 5 Oct 1986, 1500 m, *Spellenberg, Soreng & R. Corral 8900* (NMC); La Campana, Potrero la Sierra, 3 km

Pte. carr. [hwy] Panamericana, 7 Sep 73, pastizal con encino [pastureland with oak], 1500 m, *Valdés-Reyna VR-138* (RELC). **Guachochi:** White-tuff volcanic outcrops surrounding Napuchis, 2 Sep 2003, bosque de pino–pastizal, 2140 m, *P.M. Peterson & P. Catalán 17680* (CIIDIR, US); 8.5 km S of Cusarare on road to Guachochi, 25 Sep 1988, pine forest, 2400 m, *P.M. Peterson & Annable 5880* (ENCB, US). **Madera:** Mesa del Yerbánis, ejido El Largo, 12 Oct 1990, bosque de encino, 1900 m, *O. Bravo 1828* (CIIDIR); La Tinaja, ejido El Largo, 29 Aug 1990, bosque de encino–pino, 1840 m, *O. Bravo 1336* (CIIDIR, ENCB). **Matamoros:** 19.3 km S of Villa Matamoros on hwy 45 to Durango, 27 Sep 1988, pastizal, 1800 m, *P.M. Peterson & Annable 5972* (ENCB, US); 12 mi S of Villa Matamoros on hwy 45 towards Parral, 8 Oct 1966, *Reeder & C. Reeder 4630* (ARIZ). **Ocampo:** Parque Nacional “Cascada de Basaseachic,” at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue 8652* (NMC); Mesa Redonda, 4 Nov 1989, 1700 m, *J. Boyer, P.S. Martin, M.K. O’Rourke & G. Ferguson s.n.* (ARIZ); 122.5 km W of La Junta on road to Parque Nacional Cascada de Basaseachic and 56.7 km W of Tomochic, 1 Oct 1989, 2100 m, *P.M. Peterson & R.M. King 8240* (US).

### *Tragus* Haller

Annual or perennial; caespitose. Culms herbaceous, usually rooting at the lower nodes; nodes and internodes glabrous. Leaves cauline; sheaths open, usually shorter than the internodes, mostly glabrous but long-ciliate at the edges of the collar; ligules membranous, truncate, ciliate; blades usually flat, margins ciliate. Inflorescences terminal, exceeding the upper leaves, narrow, cylindrical panicles; branches resembling burs, with 2–5 spikelets; disarticulation at the base of the branches. Spikelets crowded, attached individually to the branches, with 1 floret; proximal spikelet(s) bisexual, larger than the distal spikelet(s); terminal spikelets often sterile; glumes unequal; lower glumes absent or minute, veinless, membranous; upper glumes usually exceeding the florets, 5- to 7-veined, with 5–7 longitudinal rows of straight or uncinat spine-like projections; lemmas 3-veined; paleas 2-veined, hyaline, membranous.  $x = 10$ .

*Tragus* has seven species, all of which are native to the tropics and subtropics of the Eastern Hemisphere; one is introduced into Chihuahua (Peterson et al., 2016).

366. *Tragus berteronianus*\* Schult., Mant. 2: 205. 1824.

Annual. Culms (2)3.5–45 cm tall. Ligules 0.5–1 mm long; blades (0.5)0.7–8.5 cm long, 1.2–5 mm wide, glabrous. Panicles (1)2–13 cm long, (3)4–8 mm wide; rachises pubescent; branches (0.5)0.7–2.7 mm long, pubescent, with 2(3) spikelets, axes occasionally extending past the distal spikelets; proximal internodes 0.2–0.6(0.7) mm long, shorter than the second internodes. Lower spikelets (1.8)2–4.3 mm long; upper spikelets (0.8)1–3.9 mm long, sometimes sterile; lower glumes 0.1–0.6 mm long,



membranous, minutely pubescent; upper glumes 1.8–4.3 mm long, minutely pubescent, 5-veined, rarely with 1–2 additional veins adjacent to the midvein; glume projections (4)6–14, in 5 rows, (0.2)0.3–1 mm long, uncinately; lemmas (1.5)1.8–3.1 mm long, sparsely pubescent on the back, midveins occasionally excurrent, the mucros to 0.6 mm long; paleas (1.3)1.5–2.4 mm long; anthers 3, 0.4–0.6 mm long, yellow, occasionally purple or green-tinged. Caryopsis (0.9)1.2–2 mm long, 0.4–0.8 mm wide.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Tragus berteroni-anus* is native to Africa and Asia and is now established in Arizona, New Mexico, and Texas to Mexico and Central and South America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Buenaventura:** 7 km al sur [S] de Buenaventura, 5 Sep 76, pastizal [pastureland], 1574 m, A. Melgoza 347 (RELC). **Camargo:** E Chihuahua, 10 mi SE of Organos, N slopes of the igneous Sierra de los Organos, 5 Oct 1941, Stewart & Johnston 2036 (US). **Chihuahua:** near Chihuahua, 19 Aug 1885, C.G. Pringle 421 (US); 15 Oct 1935, LeSueur Mex-033 (US); 5 mi SW of Chihuahua on rd to Cuauhtémoc, 6 Oct 1959, Soderstrom 900 (US); La Campana Experimental Station and Rancho El Arco Iris, 81–84 km along Pan American Hwy to Chihuahua City, Oct 1977, 1500 m, J.K. Meents & W.H. Moir 95 (NMC); La Campana; potrero El Plan, 3 km Ote. [W] carr. [hwy] Panamericana, 31 Aug 1973, pastizal, 1500 m, Valdés-Reyna VR-49 (RELC); 5 km Ote. carr. Panamericana, 18 Sep 73, orilla de camino [wayside], 1500 m, Valdés-Reyna VR-324 (RELC); km 54 carr. Panamericana entrada [entry] a El Sauz, 9 Oct 74, pastizal, 1500 m, Valdés-Reyna VR-639 (RELC). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1460 m, L. H. Harvey 1614 (US); Rancho El Carrizo, 30 Sep 1982, pastizal, P. Rojas s.n. (CIIDIR). **Jiménez:** 9 mi W of Jiménez, 6 Sep 1967, Reeder & C. Reeder 4832 (ARIZ); 33 mi SE of Jiménez,

27 Sep 1963, Reeder & C. Reeder 3612 (ARIZ); Costado del Río Florido, Torreoncitos, 4 Aug 2010, 1330 m, D. Noya & M.L. Juárez 3411 (CIIDIR). **Juárez:** Médanos de Samalayuca, 13 Oct 1997, km 70, I. Enríquez, S. Ordoñez & J. Leyva IEA22 (UACJ). **Riva Palacio:** Arroyo del Nido, 1.2 mi by dirt road, E of Rancho El Nido, 8 Oct 1982, grassland, 1400 m, F.W. Reichenbacher 1327 (ARIZ).

### *Tridens* Roem. & Schult.

Perennial; usually caespitose, often with short, knotty rhizomes, occasionally with elongate rhizomes, never stoloniferous. Culms erect, mostly glabrous, lower nodes sometimes with hairs. Sheaths shorter than the internodes, open; ligules membranous and ciliate or of hairs; blades flat or involute, margins not thick and cartilaginous. Inflorescences terminal, usually panicles (sometimes reduced to racemes), exceeding the upper leaves, exserted. Spikelets laterally compressed, with 4–11(16) florets, more than 1 floret bisexual; sterile florets distal to the bisexual spikelets; disarticulation above the glumes; glumes from shorter than to equaling the distal florets; lower glumes 1(3)-veined; upper glumes shorter than or about equal to the lower glumes, 1- to 3(9)-veined, unawned; calluses usually glabrous, sometimes pilose; lemmas hyaline or membranous, 3-veined, veins usually shortly hairy below, apex rounded to truncate, emarginate to bilobed, midvein often excurrent to 0.5 mm long, lateral veins not or more shortly excurrent; paleas glabrous or shortly pubescent on the lower back and margins, veins glabrous or ciliolate, margins widened or bowed-out below; lodicules 2, free or adnate to the palea; anthers 3, reddish-purple. Caryopsis dorsiventrally compressed and reniform in cross section, dark brown; embryos about  $\frac{2}{3}$  as long as the caryopsis.  $x = 10$ .

*Tridens*, a genus of 16 species, is native to the Americas; 2 species are found in Chihuahua (Peterson et al., 2016).

### KEY TO SPECIES OF *TRIDENS*

1. Panicles 0.3–4 cm wide, dense and spikelike; primary panicle branches appressed to strongly ascending; pedicels 1–2 mm long ..... *T. albescens*
1. Panicles 1–20 cm wide, open, never spikelike; primary panicle branches ascending to reflexed; pedicels (2)3–6 mm long ..... *T. texanus*

367. *Tridens albescens* (Vasey) Wooton & Standl., New Mexico Agric. Exp. Sta. Bull. 81: 129. 1912.

Plants caespitose, often with hard, knotty, short rhizomatous bases. Culms 30–100 cm tall; lower nodes sometimes sparsely bearded. Sheaths glabrous, not or obscurely keeled; ligules to 0.5 mm long, membranous, ciliate; blades 1–4 mm wide, folded or involute, glabrous, apex sharp. Panicles 8–25 cm long, 0.5–1.3 cm wide, dense; branches appressed, lowest branches 2–6 cm long; pedicels 1–2 mm long. Spikelets 4–10 mm long, with 4–11 florets; glumes about as long as the adjacent lemmas, thin, 1-veined, acute or apiculate; lower glumes 4–4.5 mm long; upper glumes 4–4.5 mm long; lemmas 3–4(5) mm long, thin, papery,

mostly white, often purple distally, glabrous or the lateral veins with a few short hairs toward the base, all veins ending before the distal margin; paleas 3–3.5 mm long, glabrous, bowed-out at the base; anthers 1–1.5 mm long. Caryopsis 1.5–1.8 mm long.  $2n = 60, 64, 72$ .

**DISTRIBUTION AND HABITAT.** *Tridens albescens* grows in plains and open woods, often in clay soils that periodically receive an abundance of water. Its range extends into northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Cuauhtémoc:** 16 mi NW of Zavalza, 3 Oct 1966, Reeder & C. Reeder 4573 (ARIZ).

368. *Tridens texanus* (S. Watson) Nash, Fl. S.E. U.S. 142. 1903.

Plants caespitose, with knotty, short rhizomatous bases. Culms 20–75 cm tall, slender, strictly erect; nodes glabrous; internodes often pilose. Sheaths mostly glabrous or pilose throughout, collar and distal portion of the margins densely pilose; ligules to 0.5 mm long, membranous, ciliate; blades 1–3(5) mm wide, flat or becoming inrolled, hispid, with long hairs on the adaxial surface just above the ligule, apex attenuate. Panicles 5–16 cm long, 2–9 cm wide, open or loosely contracted; branches (2)4–7 cm long, slender, lax, strongly divergent to drooping, basal portion naked, spikelets confined to the distal portion; pedicels (2)3–6 mm long. Spikelets 6–13 mm long, with 6–12 florets; glumes glabrous, 1-veined; lower glumes 3 mm long; upper glumes 3.5–4 mm long, veins bright green; lemmas 3–4.5 mm long, usually purple or rosy-purple at maturity, veins pilose to midlength, lateral veins often excurrent as short points; paleas 3–3.5 mm long, glabrous, abruptly broadened and bowed-out below; anthers 1–1.5 mm long. Caryopsis 1.5–2 mm long.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Tridens texanus* grows in clayey and sandy loam soils, often in the protection of shrubs and along fenced road rights-of-way. Its range extends from southern Texas into northern Mexico. This species has been reported from Chihuahua (Espejo Serna et al., 2000).

***Tridentopsis* P. M. Peterson**

Plants caespitose perennials; with knotty, short rhizomatous bases. Culms 20–80 cm tall, nodes often bearded, the hairs up to 2 mm long, soft. Leaf sheaths glabrous, scabrous, often pilose; ligules 0.4–1.5 mm long; blades up to 15 cm long, 1–5 mm wide, flat to involute. Panicles 7–28 cm long, 1–6 cm wide, narrow spreading; branches up to 13 cm long, erect appressed. Spikelets 7–13 mm long, 2- to 11-flowered, laterally compressed; disarticulation above the glumes; glumes 3–10 mm long, 1- to 7-veined, glabrous; lemmas 3.5–7 mm long, 3-veined, usually purple tinged, midveins sometimes excurrent, pubescent to pilose along the veins; paleas 1.5–5 mm long, shorter than the lemmas, glabrous or hairy. Caryopsis 1.5–2.6 mm long, dorsally flattened and deeply concave to folded on the dorsal or hilar surface and thickened toward the margin below, surface is reticulate, reddish-brown.  $2n = 40$ .

The genus *Tridentopsis* has two species; both are distributed in the southwestern United States, northern Mexico, and the Caribbean (Peterson et al., 2014a, 2016). Plants occur on clay to sandy and rocky soils in arid environments from 0 to 2,000 m.

*Tridentopsis* differs from *Tridens* Roem. & Schult. in having paleas that are not widened or bowed-out below and caryopses that are dorsally flattened and deeply concave to folded on the dorsal or hilar surface, and thickened toward the margin below, the surface reticulate, reddish-brown (Peterson et al., 2014a).

369. *Tridentopsis mutica* (Torr.) P. M. Peterson var. *mutica*, Taxon 63(2): 284. 2014. *Tridens muticus* (Torr.) Nash, Fl.

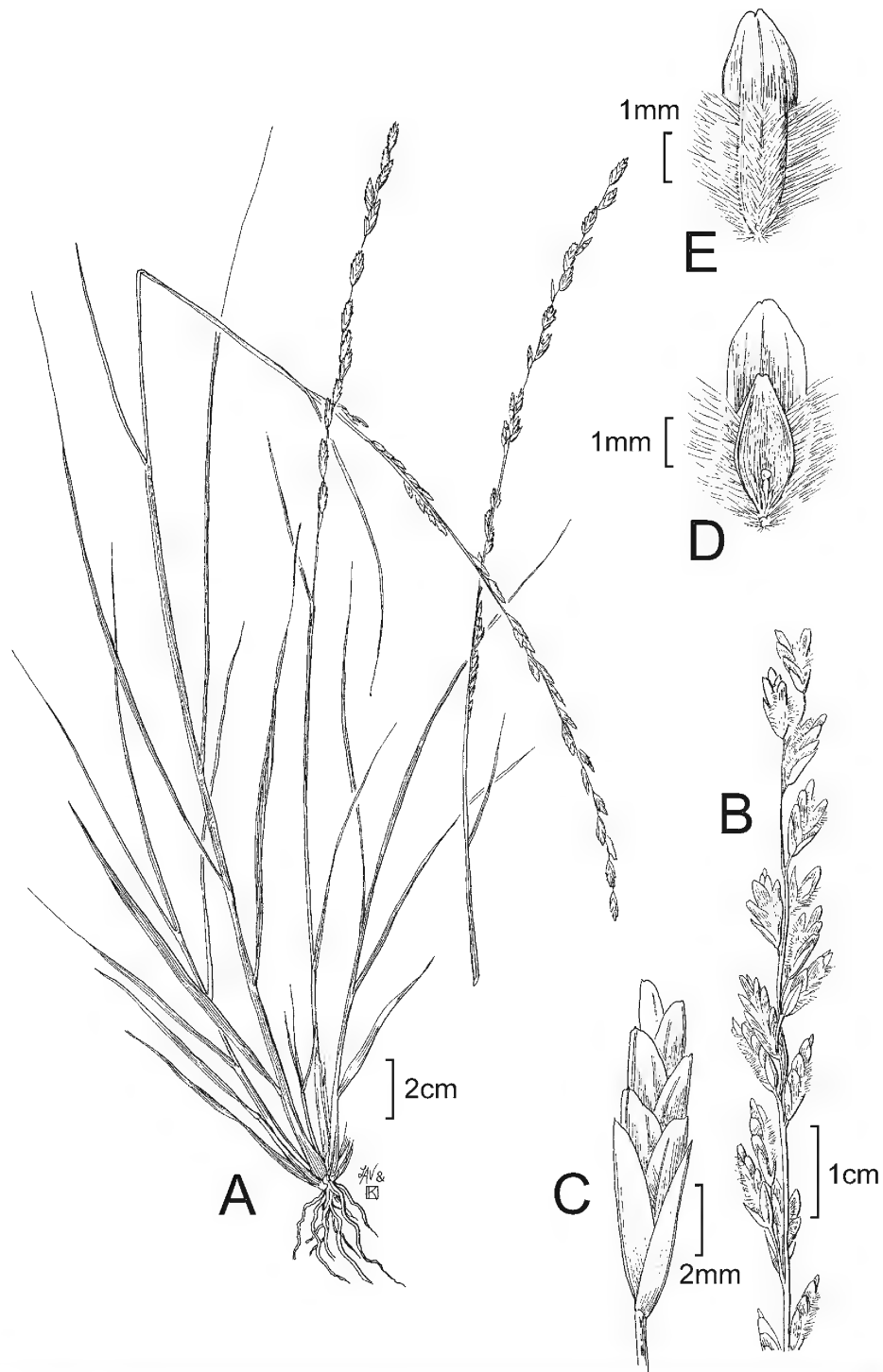
S.E. U.S. 143. 1903. *Tricuspis mutica* Torr., Pacif. Railr. Rep. 4(5): 156. 1857.

FIGURE 238

Plants caespitose, with knotty, short rhizomatous bases. Culms 20–80 cm tall; nodes often with soft, 1–2 mm hairs. Sheaths rounded, lower sheaths often strigose or pilose, upper sheaths glabrous or scabrous; ligules 0.5–1 mm long, membranous, ciliate; blades 1–4 mm wide, usually involute or loosely infolded, glabrous, scabrous, or sparsely pilose, attenuate distally. Panicles 7–20(25) cm long, 0.3–0.8 cm wide; branches erect, spikelets imbricate but usually not crowded; pedicels 1–2 mm. Spikelets 8–13 mm long, with 5–11 florets; glumes glabrous, usually purple-tinged; lower glumes 3–8(10) mm long, 1- to 3-veined; upper glumes 4–10 mm long, 1- to 7-veined; lemmas 3.5–7 mm long, usually purple-tinged, midveins pilose on the basal  $\frac{1}{3}$ – $\frac{1}{2}$ , rarely excurrent, lateral veins pilose to well above midlength, never excurrent; paleas 1–2 mm shorter than the lemmas, margins pubescent; anthers 1–1.5 mm long. Caryopsis 1.5–2.3 mm long.  $2n = 40$ .

**DISTRIBUTION AND HABITAT.** *Tridentopsis mutica* var. *mutica* is a common species on dry, sandy or clay soils in the arid southwestern United States and adjacent Mexico. *Tridentopsis mutica* var. *elongata* (Buckley) P. M. Peterson & Romasch., known only from Texas, differs in having longer, widely spaced primary branches that are usually spreading up to 80° from the culm axis (Valdés-Reyna, 2003; Peterson et al., 2016).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** ca 23 (air) mi ENE of Villa Ahumada in NW canyon of Sierra de la Alcaparra, 12 Sep 1973, J. Henrickson 12840 (NMC). **Aldama:** km 50 Chihuahua–Ojinaga, 24 Aug 1978, matorral inerme parvifolium [unarmed small-leaved scrub], Molinar-Rodríguez & Baray 24 (CIIDIR); 91 km carr. [hwy] Chihuahua–Ojinaga, 29 Aug 1978, matorral, 1395 m, R. Molinar 67 (MEXU); km 50 Chihuahua–Ojinaga, 24 Aug 1978, matorral, 1250 m, R. Gutierrez 17 (MEXU); 38 (rd) mi NE of Aldama along hwy 16 (km 88), on broad, 15 Sep 1972, pastizal [pastureland], 4700 ft, J. Henrickson 7609, 7687 (MEXU). **Allende:** Rancho La Reforma, Valle de Allende, 18 Sep 1981, matorral mediano sub-inerme [mostly unarmed scrub], 1600 m, J.S. Sierra Tristán s.n. (CIIDIR). **Buena Ventura:** Ejido El Apache, 6 Oct 1981, pastizal, 1600 m, B. Ferreiro 1731 (MEXU). **Camargo:** 16 mi SE of Camargo, 3 Oct 1966, Reeder & C. Reeder 4841 (ARIZ). **Coyame:** km 180 carr. Chihuahua–Ojinaga, 18 Oct 74, matorral, 1650 m, Valdés-Reyna VR-719 (RELC). **Jiménez:** 33 mi SE of Jiménez, 27 Sep 1963, Reeder & C. Reeder 3615 (ARIZ); 50 km al S de Jiménez, 15 Aug 2010, 1442 m, D. Ramírez & M.L. Juárez 3413 (CIIDIR). **La Cruz:** Carret. Camargo–Chih., km 18, 29 Sep 1995, matorral, 1220 m, Quiñones 109 (MEXU). **Meoqui:** Julimes-Felipe Ángeles, 31 Aug 1976, matorral, 1290 m, S. González & J.M. Peña 385 (RELC). **Ojinaga:** Carr. Panamericana, 2 km al N de carr. a Presidio, 24 Oct 74, matorral, 1400 m, Valdés-Reyna VR-770 (RELC). **Práxedes G. Guerrero:** Sierra San Ignacio, 7.5 km al W de Col. Esperanza, 18 Mar 1995, en lecho [bed] de arroyo, 1190 m, R. Corral, P. Olivas & E. Pérez RCD6052 (UACJ).



**FIGURE 238.** *Tridentopsis mutica* var. *mutica*. A. Habit. B. Inflorescence. C. Spikelet. D. Floret showing palea. E. Floret showing lemma. Drawn by Linda Ann Vorobik and Karen Klitz; copyright Utah State University.

***Triniochloa* Hitchc.**

Perennial; caespitose or rhizomatous. Leaves narrow; sheaths with the edges united. Inflorescences in form of a terminal panicle. Spikelets with 1 floret, disarticulating over the glumes; glumes subequal, 1-veined, purple, usually short; florets slender, subcylindrical; lemmas 7- to 9-veined, faintly veined, the margins somehow inrolled over the paleas, firmer than glumes; callus oblique, barbed with straight hairs; lemma apex acuminate, membranous, 2-toothed, the awn inserted above the half of the back; paleas almost as long as lemmas, 2-veined, veins very close to each other, scabrous; rachilla not extended farther than the palea.

*Triniochloa* is an American genus with six species; five are found in Mexico.

370. *Triniochloa laxa* Hitchc., Contr. U.S. Natl. Herb. 17(3): 304. 1913.

Plants perennial; rhizomatous, rhizomes 0.8–1 mm thick. Culms 40–80 cm tall. Sheaths pubescent; ligules 1.5–2.5 (3) mm long; blades 15–25 cm long, 3–5 mm wide, persistent. Panicles 7–13 cm long, partially exserted, erect, narrow, with 6–18 spikelets. Spikelets 10–15 mm long; glumes subequal, 1-veined, purple, lower glumes 7.5–13 mm long, upper glumes 10–15 mm; lemmas 10–14.5 mm long, 7-veined, margins somehow inrolled over the palea, firmer than glumes, awns 12–22 mm long, dorsal, geniculate; paleas almost as long as lemmas, 2-veined, veins very close to each other, scabrous; rachilla not extended farther than the palea; anthers 5–7 mm long.

**DISTRIBUTION AND HABITAT.** *Triniochloa laxa* is known only from Chihuahua, Mexico. *Triniochloa laxa* differs

from other Mexican species of *Triniochloa* in having upper glumes about as long as the lemma, leaf blades 3–4 mm wide, and ligules 1.5–2.5 (3) mm long (Hitchcock 1913, 1935).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guerrero:** On road between Tomochic and Bassaseachic, 20 mi E of jct w/ road S to San Juanito, 1.8 mi W of Aqua Caliente, 5 Oct 1986, 2000 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8876 (NMC).

***Tripsacum* L.**

Perennial; monoecious, staminate and pistillate spikelets evidently distinct, located in the same inflorescences, pistillate spikelets below the staminate spikelets. Culms 0.7–5 m. Leaves not aromatic; sheaths open; ligules membranous, erose to ciliate. Inflorescences terminal and axillary, panicles of 1 to several subdigitate to racemose rames; rames with pistillate spikelets proximally and staminate spikelets distally; disarticulation in the rames, beneath the pistillate spikelets and at the base of the staminate portions. Pistillate spikelets exposed, solitary, embedded in the indurate rame axes; lower glumes coriaceous, closing the hollows in the rachises and concealing the florets; upper glumes similar but smaller; lower florets sterile; upper florets pistillate; lemmas and paleas hyaline, unawned; styles 2, not fused; staminate spikelets paired, both sessile or both subsessile, or 1 sessile and the other pedicellate; glumes coriaceous, chartaceous, or membranous; lemmas and paleas hyaline, unawned; pedicels (when present) not fused to the rame axes.  $x = 9$ .

*Tripsacum* is a genus of 12 species. All are native to tropical and subtropical regions of the Western Hemisphere, and three are native to North America.

**KEY TO SPECIES OF *TRIPSACUM***

1. Superior spikelets of the staminate pair with slender pedicels 2–5 mm long; staminate portion of the inflorescence flexuous and pendulous; culms 1–2 m tall; terminal inflorescence with 2–5(9) racemes ..... *T. lanceolatum*
1. Staminate spikelets on every pair sessile or almost sessile, or the superior with a thick pedicel 1–2 mm long, staminate portion of the inflorescence erect or lightly curved; inflorescence with 2 to 3 racemes, sometimes solitary.
  2. Culms 0.6–1.2(1.5) m tall, 3–4 mm thick at the base; blades 0.5–1(1.6) cm wide, usually forming basal tufts at the flowering time; spike solitary, rarely 2 ..... *T. zopilotense*
  2. Culms 2–4 m tall, 5–10 mm thick at the base; blades 1.5–2.5 cm wide, generally cauline; spikes usually 2 or 3, occasionally solitary ..... *T. dactyloides*

371. *Tripsacum dactyloides* (L.) L., Syst. Nat. (ed. 10) 2: 1261. 1759. *Coix dactyloides* L., Sp. Pl. 2: 972. 1753.

FIGURE 239

Plants with short, knotty rhizomes. Culms 1–2(4) m tall, 3–5 mm thick below, clumped. Sheaths usually glabrous, occasionally slightly pilose; ligules ciliate; blades 30–75(120) cm long, 9–35(45) mm wide, flat, usually glabrous, tapering to attenuate apex. Terminal inflorescences erect, with (1)2–3(6) rames; rames 12–25 cm long. Pistillate spikelets 6–8 mm long, 3–5.5 mm wide; staminate spikelets all sessile or subsessile; glumes 5–12 mm long, coriaceous, blunt, acute, or bifid; pedicels, when present,

about 1 mm long, 0.5–0.8 mm wide, triangular in cross section, rigid.  $2n = 36, 54, 72$ .

**DISTRIBUTION AND HABITAT.** *Tripsacum dactyloides* grows in water courses and limestone outcrops from central and eastern United States through Mexico to northern South America. Plants from the United States and northern Mexico belong to *Tripsacum dactyloides* var. *dactyloides*. This variety differs from the other two varieties in having erect stems and sessile staminate spikelets (Barkworth, 2003b).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 7.4 km W of Balleza on road to Guachochi, 18 Sep 1991, huizachal, 1660 m, *P.M. Peterson, Annable & Valdés-Reyna*



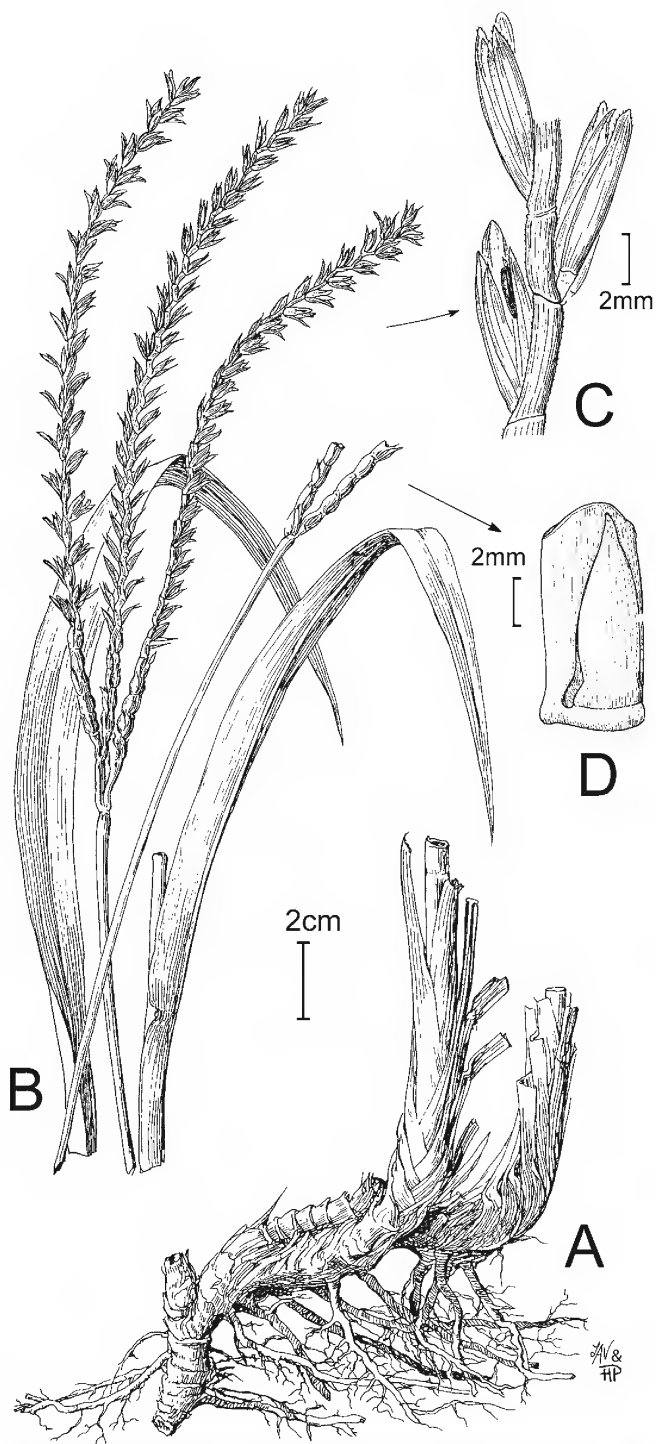


FIGURE 239. *Tripsacum dactyloides*. A. Culm base with short, knotty rhizome. B. Inflorescence and leaf blades. C. Inflorescence branch with staminate spikelets. D. Pistillate spikelet. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

10736 (CIIDIR, US); 11 mi SE of Balleza on road to Parral, 1800, P.M. Peterson, M.B. Knowles, C.H. Dietrich & S.M. Braxton 13521 (US); 19.3 km SE of Balleza towards Parral, 26 Sep 1988, oak woods, 1800 m, P.M. Peterson & Annable 5943 (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, tropical deciduous forest, 1001 m, P.M. Peterson & J.M. Saarela 22155 (US). **Madera:** Paraje Sirupa, ejido Cebollitas, 26 Aug 1990, bosque de encino [oak forest], 1200 m, A. Benítez 1998 (CIIDIR); Paraje Agua Caliente, predio particular [private property] El Chorruto, 26 Aug 1990, bosque de encino, 1500 m, O. Bravo 1301 (CIIDIR).

372. *Tripsacum lanceolatum* Rupr. ex E. Fourn., Mexic. Pl. 2: 68. 1886.

FIGURE 240

Plants rhizomatous. Culms 1–2 m tall, 2–4 mm thick below. Lower sheaths hispid; upper sheaths essentially glabrous; ligules erose, not ciliate; blades to 100 cm long, 8–30 mm wide, glabrous or slightly pubescent. Terminal inflorescences with 4–7(10) rames. Pistillate spikelets 2–3 mm wide, beadlike in appearance; staminate spikelets in sessile-pedicellate pairs; glumes 5–10 mm long, 1.5–2 mm wide, usually membranous, acute; pedicels 2–5 mm long, less than 0.3 mm wide, almost flat to plano-convex in cross section, flexible.  $2n = 72$ .

**DISTRIBUTION AND HABITAT.** *Tripsacum lanceolatum* grows in moist soil (often in canyon bottoms) of mountains from southeastern Arizona and southwestern New Mexico through Mexico to Guatemala.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna:** cerca [near] de Estación Divisadero, 16 Aug 1976, bosque de pino-encino [pine-oak forest], 1875 m, S. González 693 (RELC). **El Tule:** 19.3 km SE of Balleza towards Parral, 26 Sep 1988, oak woods, 1800 m, P.M. Peterson & Annable 5943 (ENCB). **Chinipas:** 1 mi E of Saguarivo, 10 Sep 2008, small arroyo with oaks and pines, 1490 m, P.M. Peterson & J.M. Saarela 22161 (US). **Guachochi:** 24.6 km S of Mex 127 and 11.1 km NE of La Bufa, 11 Sep 1989, 2000 m, P.M. Peterson, Annable & Y. Herrera 8052 (ENCB, US). **Moris:** 9 mi E of Yécora on hwy 16 towards Maycoba and 5 mi SE on a dirt road towards Talayote, 13 Oct 1992, bosque de Encino, 1800 m, P.M. Peterson & Annable 12480 (US).

373. *Tripsacum zopilotense* Hern.-Xol. & Randolph, Folleto Técn. de Estud. Espec. México 4: 22. 1950.

Plants caespitose, in large groups. Culms 0.6–1.2(1.5) m tall, 3–4 mm thick on the base, pilose or glabrous below the spikes. Inferior sheaths strongly hispid, the superior hirsute to glabrous; blades 25–35 cm long, 0.5–1(1.6) cm wide, pilose on both surfaces, forming basal tufts at flowering time. Inflorescences 10–16 cm long, a solitary raceme, rarely 2 then digitate, the pistillate portion 4–7 cm long, 2–2.5 mm thick when mature, rounded, with 5–11 pistillate spikelets, 5–7 mm long. Staminate spikelets 5–7 mm long, sessile; inferior glumes coriaceous.  $2n = 36$ .





FIGURE 240. *Tripsacum lanceolatum*. A. Inflorescence and leaf blades. B. Inflorescence branch with staminate spikelets. Drawn by Linda Ann Vorobik and Hana Pazdírková; copyright Utah State University.

**DISTRIBUTION AND HABITAT.** *Tripsacum zopilote* grows in grasslands, oak woodlands, and pine forests; it is known from Mexico and Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Guachochi:** slopes above Barranca de Basihuare, 28 Aug 2003, with *Quercus-Pinus ponderosa*, 1815 m, P.M. Peterson & P. Catalán 17574 (CIIDIR, US); W of Munérachi, 7 Sep 2003, matorral espinoso [thorny scrub], 1200 m, P.M. Peterson & P. Catalán 17715 (US). **Ocampo:** Parque Nacional "Cascada de Basaseachic," ca. 130 air km W of Cuauhtemoc, 12 Sep 1987, 1700 m, Spellenberg & D. Jewell 9260 (NMC); Parque Nacional "Cascada de Basaseachic," ca. 100 m upstream from the top of the falls along the Rio Basaseachi, 17 Jun 1993, 2000 m, Spellenberg, L. Brouillet & E. Ulaszek 11871 (NMC); Beside the road near Ocampo, 26 Jul 1990, 2000 m, P. Jenkins 90-295 (ARIZ).

### *Trisetum* Pers.

Annual or perennial; sometimes rhizomatous, sometimes caespitose. Culms glabrous or pubescent, basal branching extravaginal. Sheaths open the entire length or fused at the base; auricles absent; ligules membranous, often erose to lacerate, sometimes ciliate; blades rolled in the bud. Inflorescence a terminal panicle, open and diffuse to dense and spike-like; branches antrorse-scarious. Spikelets usually subsessile to pedicellate, rarely sessile, laterally compressed, with 2–5 florets; reduced florets (if present) distal; rachillas hairy, internodes evident, prolonged beyond the distal bisexual florets; disarticulation usually above the glumes and between the florets, subsequently below the glumes, in some species initially below the glumes; glumes subequal or unequal, keels scabrous, apex usually acute and unawned, often apiculate; lower glumes 1(3)-veined; upper glumes 3(5)-veined, lateral veins less than  $\frac{1}{2}$  the glume length; calluses hairy; lemmas 3- to 7-veined, margins hyaline, unawned or awned from above the middle with a single awn, apex usually bifid, sometimes entire; paleas subequal, equal to, or longer than the lemmas, membranous, 2-veined, veins usually extended as bristlelike tips; lodicules 2, shallowly and usually slenderly lobed to fimbriate; anthers 3; ovaries glabrous or pubescent; styles 2. Caryopsis elongate-fusiform, compressed, brown; embryos elliptic, to  $\frac{1}{3}$  the length of the caryopsis; endosperm milky.  $\times = 7$ .

*Trisetum* is a genus of approx. 96 species occurring primarily in temperate, subarctic, and alpine regions and is currently being re-evaluated (Soreng et al., 2017b). There are approximately 38 species in North America (Finot et al., 2004).

### KEY TO SPECIES OF *TRISETUM*

1. Lemma apically entire, slightly 2-toothed or irregularly toothed, veins not prolonged farther than the apex; lemmas muticous to short-awned, the awn subapical ..... *T. filifolium*
1. Lemma 2-toothed on the apex, intermediate veins and/or marginal ones elongated beyond the apex forming 2–4 apical bristles; apical teeth veinless; lemmas awned, the awns well-developed, inserted on the distal  $\frac{1}{3}$ ,  $\frac{1}{2}$ , or proximal  $\frac{1}{3}$  of the lemma, never subapical.

2. Awns always inserted on the distal  $\frac{1}{3}$  of the lemma (occasionally so in *T. palmeri*); glumes unequal, the lower glumes shorter and narrower than upper glumes; apex of the lemma with 2 bristles formed by the projection of the intermediate veins; lemmas clearly keeled in cross section ..... *T. spicatum*
2. Awns inserted on the proximal  $\frac{1}{3}$  or nearly  $\frac{1}{2}$  of the lemma; glumes subequal, almost as long as the spikelets or longer; lemmas with apical teeth lacking prolongations of the intermediate veins or having 2–4 bristles; lemma rounded in cross section.
3. Lemmas with the apex 2-lobed and 4-awned as teeth or bristles.
  4. Ligules 3–6 mm long; paleas as long as or slightly longer than the lemmas; hairs of the rachilla 0.5–1(1.4) mm long ..... *T. palmeri*
  4. Ligules 0.5–1(2) mm long; paleas shorter than the lemmas; hairs of the rachilla 1.5–3 mm long ..... *T. viride*
3. Lemmas with the apex 2-lobed, unawned or having additional bristles.
  5. Spikelets bearing (4)5–6 florets ..... *T. spellenbergii*
  5. Spikelets bearing 2–4 florets.
    6. Ligules 3–6 mm long; paleas as long as or slightly longer than the lemmas; hairs of the rachilla 0.5–1(1.4) mm long ..... *T. palmeri*
    6. Ligules 0.5–1(2) mm long; paleas shorter than the lemmas; hairs of the rachilla 1.5–3 mm long .... *T. viride*

**374. *Trisetum filifolium*** Scribn. ex Beal, Grass. N. Amer. 2: 375. 1896.

Perennial; caespitose. Culms 30–60 cm tall, glabrous. Sheaths glabrous, escabrous or pubescent; ligule (0.2)1–3.5 mm long, membranous, truncate, glabrous; blades 5–22 cm long, 0.5–2 mm wide, involute, filiform, curves and flexuous, glabrous to slightly scabrous. Panicles 12–15 cm long, 2–3 cm wide, lax, little spread, narrow, exserted, branches semiverticillate, with 3–7(8) branches per node, the inferior 4–6 cm long, rachis glabrous. Spikelets 3.5–6 mm long, with (1)2–3 florets, pedicels scabrous, rachilla 1–1.2 mm long, with hairs 1.5 mm long, longer than the apex; glumes subequal, lower glumes 2.5–6 mm long, 1(3)-veined, upper glumes 3–7 mm long, 3-veined; lemmas 3.5–5 mm long, obscurely veined, scabrous-pubescent, apex entire to shallowly bifid, every lobule mucicous to mucronate, the mucro 0.2–0.5 mm long; paleas 3–4.5 mm long, keels ciliate or scabrous; anthers 1–2 mm long. Caryopsis 1.5–2 mm long with solid endosperm.

**DISTRIBUTION AND HABITAT.** *Trisetum filifolium* is a Mexican species with two varieties, only *Trisetum filifolium* var. *aristatum* Scribn. ex Beal grows in the moist, forested areas of Chihuahua and Durango.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocovina:** Sánchez, 8000 ft, *Hitchcock* 7682 (MEXU); SW of Creel along Rio Oteros and in stand of *Picea chihuahuana*; 14 Aug 1977, *Bye* 8018 (MEXU); S of San Ignacio Arareco, south of airstrip, SE of Creel, 27.7°N, 107.7°W, 20 Jul 1972, 2255 m, *Bye* 2404a (MEXU). **Guachochic:** Approx. 22.5 mi NE of Cienequita de Barranca on road towards Creel, 5 Sep 2003, bosque de pino [pine forest], 2160 m, *P.M. Peterson* & *P. Catalán* 17696 (US); 5 km antes del entronque [before junction] a la Bufo carr. [hwy] Guachochic–Creel, 24 Sep 1981, 2500 m, *M.E. Siqueiros* 1613 (MEXU). **Guadalupe y Calvo:** on high ledges, on summit of Sierra Mohinora, 16–17 Oct 1959, 10,000–10,300 ft, *Correll* & *Gentry* 23176 (MEXU, US); Sierra Mohinora, 13 Sep 2006, 3076 m, *P.M. Peterson*, *F. Sánchez Alvarado* & *E.P. Gómez Ruiz* 20050 (CIIDIR, US). **Ocampo:** Parque Nacional “Cascada de

Basaseachic,” along river falls, 25 Abr [Apr] 1986, 1980 m, *Spellenberg*, *Soreng*, *R. Corral* & *T. Lebgue* 8434 (NMC); *Memelichi*, Rio Mayo, 14 Sep 1936, *Gentry* 2716 (MBO).

**375. *Trisetum palmeri*** Hitchc., Contr. U.S. Natl. Herb. 17: 325. 1913.

Caespitose perennial. Culms 60–100 cm tall, glabrous. Sheaths glabrous to scabrous; ligules 3–6 mm long, truncate, toothed, ciliate on the apex; blades 10–20 cm long, 1–3(5) mm wide, involute or flat, stiff, scabrous, sometimes glaucous. Panicles 10–20 cm long, 2–6 cm wide, lax, spread to narrow, branches 4–6, verticillate, rachis and pedicels glabrous. Spikelets 5–6.5 mm long, bearing 2–3 florets, rachilla 2 mm long, pubescent, the hairs 1–1.5 mm long; glumes subequal, linear-lanceolate, margin hyaline, apex acute; lower glumes 3.5–4.5 mm long, 1-veined; upper glumes 4–5 mm long, 3-veined; lemmas 4–5.3(6) mm long, fragile, translucent, 5-veined, awned, the awns 5–7 mm long, emerging from the proximal  $\frac{1}{3}$  of the lemma back, geniculate, twisted; paleas 4–5.5(6) mm long; anthers 2–2.5 mm long.

**DISTRIBUTION AND HABITAT.** *Trisetum palmeri* grows in moist meadows and forests. This species is known from Chihuahua, Coahuila, Durango, Jalisco, Nuevo León, Sinaloa, and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Madera:** Laguna de Babicora, 4 km N del Ejido La Raiz, 10 Sep 1994, 2300 m, *G. Quintana* & *E. Estrada* 3666 (NMC).

**376. *Trisetum spellenbergii*** Soreng, Finot & P. M. Peterson, Ann. Missouri Bot. Gard. 91: 1–30. 2004.

Perennial; with short rhizomes. Culms 40–60 cm tall, geniculate on the base, glabrous. Leaf sheaths open only at the apex, lower sheaths pilose, upper sheaths glabrous; ligules 4.5–6 mm long, glabrous; lacerate, eciliate; blades 20–30 cm long, 2–3.5 mm wide, the superior smaller, 10–20 cm long, flat, soft, glabrous to sparsely pilose. Panicles 9–14 cm long, 2–8 cm wide, lax, spread, exserted, branches 2–5 per node. Spikelets 7–9 mm long, bearing (4)5–6 florets, rachilla 1.5 mm long,

pubescent, hairs 1–1.5 mm long, prolongate beyond of the superior floret, with 1 reduced floret; glumes subequal, green, purple over the apex and margins, lower glumes 5.5–6.5 mm long, 0.3–0.5 mm wide, 1-veined, upper glumes 6.5–7.5 mm long, 0.6–0.8 mm wide; lemmas 4–6.5 mm long, 5-veined, glabrous, apex bilobed, lobes 2 mm long, awns 8–12 mm long, emerging midlength, twisted, geniculate; paleas 3.5–5 mm long, 2-veined, veins scabrous-ciliate; stamens 3, anthers 1.2–2.5 mm long.

**DISTRIBUTION AND HABITAT.** *Trisetum spellenbergii* grows in moist meadows in forests; it is a Mexican endemic found in Chihuahua and Sonora.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ocampo:** Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8654 (NMC); 122.5 km W of La Junta and 56.7 km W of Tomochic in Parque Nacional Cascada de Basaseachic, 2100 m, *P.M. Peterson & R.M. King* 8246 (US); at Mirador Cascada Basaseachic, 2084 m, steep slopes below ridge with *Pinus*, 7 Sep 2008, *P.M. Peterson & J.M. Saarela* 22105 (US).

377. *Trisetum spicatum* (L.) K. Richt., Pl. Eur. 1: 59. 1890. *Aira spicata* L., Sp. Pl. 1: 64. 1753.

FIGURE 241

Perennial; with both fertile and sterile shoots; caespitose, not rhizomatous. Culms 10–120 cm tall, erect, usually glabrous, sometimes scaberulous or villous. Leaves mostly basal or evenly distributed; sheaths variously pubescent or glabrous; ligules 0.5–4 mm long, truncate or rounded; blades (3)10–20(40) cm long, 1–5 mm wide, flat, folded, or involute, erect and stiff or ascending and lax. Panicles (5)20–30(50) cm long, (0.5)1–2.5(5) cm wide, from spike-like to open, often interrupted basally, green, purplish, or tawny, usually silvery-shiny; branches with the spikelets evenly distributed. Spikelets 5–7.5 mm long, sessile, subsessile, or on pedicels to 1.5(3.5) mm long, with 2(3) florets; rachilla internodes 0.5–1.5 mm long; rachilla hairs up to 1 mm long; glumes subequal to unequal, lanceolate, usually smooth, sometimes scattered scabrous or pilose, with wide scarious margins, apex acute to acuminate, sometimes apiculate; lower glumes 3–4(5.5) mm long; upper glumes 4–7 mm long, equaling or exceeding the lowest florets, less than twice as wide as the lower glumes; callus hairs to 1 mm long; lemmas 3–6(7) mm long, narrowly to broadly lanceolate, glabrous, scaberulous, or pilose, apex bifid, teeth usually less than 1 mm long, awned, awns 3–8 mm long, arising from the upper 1/3 of the lemmas, geniculate, twisted basally; anthers 0.7–1.4 mm long. Caryopsis 1.5–3(4) mm long, glabrous.  $2n = 14, 28, 42$ .

**DISTRIBUTION AND HABITAT.** *Trisetum spicatum* grows in moist meadows, forests, rock ledges, and tundra slopes and screes up to 4,300 m. Its range includes both North and South America and Eurasia.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 19.6 km W of Balleza and 74.2 km E of Guachochi,

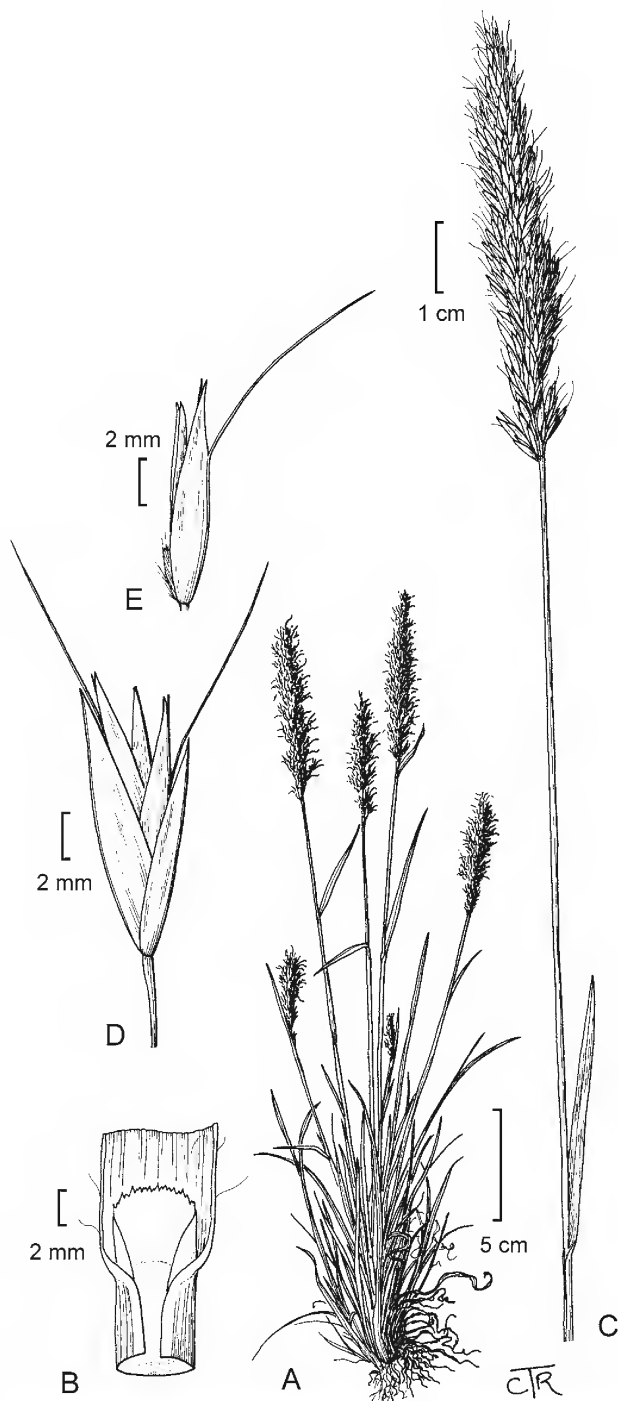


FIGURE 241. *Trisetum spicatum*. A. Habit. B. Ligule. C. Culm and Inflorescence. D. Spikelet. E. Floret. Drawn by Cindy Roché; copyright Utah State University.

18 Sep 1991, 2120 m, *P.M. Peterson, Annable & Valdés-Reyna 10752* (CIIDIR). **Bocoyna**: 20 km S of San Juanito on road to Creel and 3 km S of Bocoyna, 24 Sep 1988, pine forest, 2200 m, *P.M. Peterson & Annable 5873* (ENCB, US); 24.2 km S of San Juanito and 4.8 km N of Creel on Mex 127, 10 Sep 1989, pine forest, 2520 m, *P.M. Peterson, Annable & Y. Herrera 8007* (ENCB, US). **Guerrero**: 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, *P.M. Peterson & Annable 5848* (ENCB, US).

**378. *Trisetum viride*** (Kunth) Kunth, Révis. Gramin. 1: 101. 1829. *Avena viridis* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 147. 1815.

Caespitose perennial. Culms 50–150 cm tall, erect, glabrous, simple, the lower ½ with few leaves. Sheaths retrorsely scabrous to glabrous when mature; ligules 0.5–6 mm long, membranous, truncate, to sometimes pilose; blades 15–20 cm long, 2–6(9) mm wide, flat or some involute. Panicles 15–35 cm long, 4–6 mm wide, lax, to somewhat contracted, main axis scabrous, branches 5–16 cm long, ascending to some flexuous, naked on the lower ½. Spikelets 5–8(9.5) mm long, with 2- to 3(5)-flowered, disarticulating above glumes and between the florets; rachilla pilose, the hairs 0.5–1 mm long, sometimes finishing in a rudimentary floret; glumes subequal; lower glumes 3.5–6 mm long, 1-veined; upper glumes 4–7 mm long, 3-veined; lemma of the inferior florets 4–6 mm long, subcylindrical, margins involute, apex 2-toothed, the teeth acute or rounded, erose or with extended veins forming 4 slender teeth, awned, awns 5–10 mm long, inserted on the lower ½, geniculate, flexuous, twisted; paleas equal or not as long as the lemmas, hyaline, the keels scabrous; stamens 3, anthers 1.5–2.5 mm long. Caryopses 2–2.5 mm long, soft, endosperm liquid.  $2n = 28$ .

**DISTRIBUTION AND HABITAT.** *Trisetum viride* is found in pinyon forests in Chihuahua; it is known from Mexico to Central America.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Bocoyna**: Cabecera de la cañada de Recogoata, 22 Sep 1997, bosque de pino-encino [pine-oak forest], 2400 m, *A. Carrillo 30-A* (MEXU). **Chinipas**: 1 mi E of Sagarivo, 10 Sep 2008, small arroyo with oaks and pines, 1490 m, *P.M. Peterson & J.M. Saarela 22162* (US). **Guachochi**: 5.8 mi N of Creel on road (hwy 25) towards San Juanito, 5 Oct 2000, bosque de pino, 2480 m, *P.M. Peterson & J. Cayouette 15366* (US). **Guadalupe y Calvo**: Hwy 24, 103.5 km SW of Hidalgo del Parral, 2 Sep 1975, pine-oak-madroño woodland, 2500 m, *N.H. Holmgren 8049* (MEXU). **Ocampo**: Cordon Capellina, 5 km west of Huajumar air strip, 18 Aug 1989, pine-oak forest, 2500 m, *P. Jenkins, P.S. Martin, R. Rondeau & W.M. Pierce 89-219* (ARIZ).

### ***Triticum* L.**

Annual. Culms solitary or branched at the base; internodes usually hollow throughout in hexaploids, usually solid

for about 1 cm below the spike in diploids and tetraploids, even if hollow below. Sheaths open; auricles present, often deciduous at maturity; ligules membranous; blades flat, glabrous or pubescent. Inflorescences usually terminal spikes, distichous, with 1 spikelet per node, occasionally branched; disarticulation in the rachis, the spikelets usually falling with the internode below to form a wedge-shaped diaspore, sometimes falling with the adjacent internode to form a barrel-shaped diaspore, domesticated taxa usually nondisarticulating, or disarticulating only under pressure. Spikelets usually 1–3 times the length of the internodes, appressed to ascending, with 2–9 florets, the distal florets often sterile; glumes subequal, ovate, rectangular, or lanceolate, chartaceous to coriaceous, usually stiff, tightly to loosely appressed to the lower florets, with 1 prominent keel, at least distally, keels often winged and ending in a tooth or awn, a second keel or prominent lateral vein present in some taxa; lemmas keeled, chartaceous to coriaceous, 2 lowest lemmas usually awned, scabrous, distal lemmas unawned or awned; paleas hyaline-membranous, splitting at maturity in diploid taxa; anthers 3. Caryopsis tightly (hulled wheats) or loosely (naked wheats) enclosed by the glumes and lemmas, lemmas and paleas not adherent; endosperm flinty or mealy.  $x = 7$ .

*Triticum* is a genus of approximately 25 wild and domesticated species. It was first cultivated in western Asia at least 9,000 years ago and is now the world's most important crop, being planted more widely than any other genus.

**379. *Triticum aestivum*\*** L., Sp. Pl. 1: 85. 1753.

FIGURE 242

Culms 14–150 cm tall; nodes glabrous or pubescent; internodes usually hollow, even immediately below the spikes. Leaf blades 6–15(20) mm wide, glabrous or pubescent. Spikes (3.5)6–18 cm long, usually thicker than wide to about as thick as wide, wider than thick in compact forms; rachises shortly ciliate at the nodes and margins, not disarticulating. Spikelets 10–15 mm long, appressed or ascending, with 3–9 florets, 2–5 seed-forming; glumes 6–12 mm long, ovate, coriaceous, loosely appressed to the lower florets, usually keeled in the upper ½, sometimes prominently keeled to the base, terminating in a tooth or awn, the awns to 4 cm long; lemmas 10–15 mm long, toothed or awned, the awns to 12 cm long; paleas not splitting at maturity. Caryopsis with mealy to flinty endosperm.  $2n = 42$ .

**DISTRIBUTION AND HABITAT.** *Triticum aestivum* is the most widely cultivated wheat. Both winter and spring types are grown in Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua**: 38 km W of hwy 45 on road towards Benito Juárez, 17 Oct 1992, pinyon woodlands, 2230 m, *P.M. Peterson & Annable 12572* (US). **Juárez**: Area of high sand dunes 5 km N of Samalayuca on the Juárez hwy, 28 Oct 1972, desiertos arenoso [sandy deserts], 1250 m, *T.L. Wendt, F. Chiang & M.C. Johnston 9934* (MEXU).

***Urochloa* P. Beauv.**

Annual or perennial; usually caespitose, sometimes mat-forming, sometimes stoloniferous. Culms herbaceous, erect, geniculate, or decumbent and rooting at the lower nodes. Sheaths open; auricles rarely present; ligules apparently of hairs, the basal membranous portion inconspicuous; blades ovate-lanceolate to lanceolate, flat. Inflorescences terminal or terminal and axillary, usually panicles of spike-like primary branches in 2 or more ranks, rachises not concealed by the spikelets; primary branches usually alternate or subopposite, spike-like, and 1-sided, less frequently verticillate, axes flat or triquetrous, usually terminating in a well-developed, rudimentary spikelet; secondary branches present or absent, axes flat or triquetrous; disarticulation beneath the spikelets. Spikelets solitary, paired, or in triplets, subsessile or pedicellate, divergent or appressed, ovoid to ellipsoid, dorsally compressed, in 1–2(4) rows, with

2 florets, lower or upper glumes adjacent to the branch axes; glumes not saccate basally; lower glumes usually  $\frac{1}{5}$ – $\frac{2}{3}$  as long as the spikelets, occasionally equaling the upper florets, (0)1- to 11-veined; upper glumes 5- to 13-veined; lower florets sterile or staminate; lower lemmas similar to the upper glumes, 5- to 9-veined; lower paleas if present, usually hyaline, 2-veined; upper florets bisexual, sessile, ovoid to ellipsoid, usually plano-convex, usually glabrous, not disarticulating, mucronate or acuminate; upper lemmas indurate, transversely rugose and verrucose, 5-veined, margins involute, apex round to mucronate, or aristate; upper paleas rugose, shiny or lustrous; lodicules 2, cuneate, truncate; anthers 3. Caryopsis ovoid to elliptic, dorsally compressed; embryos  $\frac{1}{2}$ – $\frac{3}{4}$  as long as the caryopsis.  $x = 7, 8, 9$ , or  $10$ .

*Urochloa* is a genus of about 136 tropical and subtropical species. There are four species that occur in Chihuahua (Morrone and Zuloaga 1993).

**KEY TO SPECIES OF *UROCHLOA***

1. Inflorescence with racemes alternate and inserted distichously; spikelets solitary at mid-branch length; in 1–2 series; pedicels all of equal length.
  2. Rachis of the racemes triquetrous, not winged, 0.4–0.8(1) mm wide; rachilla internodes inconspicuous; lower glumes 3-veined; plants perennial . . . . . *U. meziana*
  2. Rachis of the racemes flat, winged, 1–2.5 mm wide; rachilla internodes evident between the glumes; lower glumes 9- to 11-veined; plants annual . . . . . *U. plantaginea*
1. Inflorescence with racemes alternate, subopposite, or verticillate, inserted on all sides of the main axis; spikelets paired at mid-branch length, sometimes solitary distally, in 2–4 series; pedicels unequal in length.
  3. Inflorescence branch axes densely hairy, the hairs papillose-based; spikelets 3.2–4 mm long . . . . . *U. arizonica*
  3. Inflorescence branch axes sometimes densely hairy, with few or no papillose-based hairs; spikelets 2–3 mm long . . . . . *U. fusca*

380. *Urochloa arizonica* (Scribn. & Merr.) Morrone & Zuloaga, Darwiniana 32(1–4): 61. 1993. *Brachiaria arizonica* (Scribn. & Merr.) S. T. Blake

Annual. Culms 15–65 cm tall, erect or geniculate, branching from the lower nodes; nodes glabrous or hispid. Sheaths glabrous or with papillose-based hairs, margins ciliate distally; ligules 1–1.6 mm long; blades 5–15 cm long, 5–12 mm wide, glabrous. Panicles 6–20 cm long, 2–5 cm wide, ovoid, with 6–12 raceme-like branches in more than 2 ranks; primary branches 3–7 cm long, divergent, axes about 0.4 mm wide, triquetrous, densely pubescent with papillose-based hairs; secondary branches short, divergent; pedicels shorter than the spikelets, with papillose-based hairs. Spikelets 3.2–4 mm long, 1.2–1.6 mm wide, mostly paired, in 2 rows, appressed to the branches; glumes scarcely separate, rachilla internodes short, not pronounced; lower glumes 1.5–2 mm long, to  $\frac{1}{2}$  as long as the spikelets, glabrous, 5-veined, sometimes with evident cross venation near the apex; upper glumes 2.5–3.2 mm long, glabrous or short hirsute, 7-veined, with evident cross venation distally; lower florets staminate or sterile; lower lemmas 2.5–3.2 mm long, about as long as the spikelet, glabrous or short hirsute, 5-veined; lower paleas present; upper lemmas 2.8–3 mm long, 1.2–1.6 mm wide,

acute, beaked or mucronate; anthers 0.8–1 mm long. Caryopsis 1.5–2 mm long; hila punctiform.  $2n = 36$ .

**DISTRIBUTION AND HABITAT.** *Urochloa arizonica* is native to the southwestern United States and northern Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Aguiles Serdán:** 20 km al S de Chihuahua, carr. [hwy] Chihuahua–Delicias, 26 Oct 76, matorral [scrub], 1450 m, *Valdés-Reyna VR-810* (RELC). **Bocoyna:** entre [between] barrancas del cobre & Bachipere, 17 Aug 1976, bosque bajo de leguminosas [low legume forest], 1025 m, *S. González & J.M. Peña* 729 (ENCB, RELC). **Buenaventura:** km 11 San Buenaventura–El Carmen 23 Oct 1954, matorral xerófilo [xerophilous scrub], 1400 m, *Hern.-Xol. & Tapia N-137* (ENCB, US). **Camargo:** 20 km S of cd Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1391 (ENCB). **Chihuahua:** near Chihuahua, 16 Jul 1936, *LeSueur* 124 (US); *LeSueur Mex-012* (US); 23 Aug 1885, *C.G. Pringle* 487 (US); 13 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1585 m, *Soderstrom* 916-A, 924 (US); 54 mi N of Chihuahua, 23 Oct 1957, *G. Morrow* 7950 (US); 5 mi SW of Chihuahua on road to Cuauhtémoc, 6 Oct 1959, 1463 m, *Soderstrom* 902 (US); km 14 al N de Cd. Chihuahua, 15 Sep 1955, 1400 m, *Hern.-Xol. & V. Mathus N-1753* (US); 6 mi N of Chihuahua, 8 Oct 1959, 1494



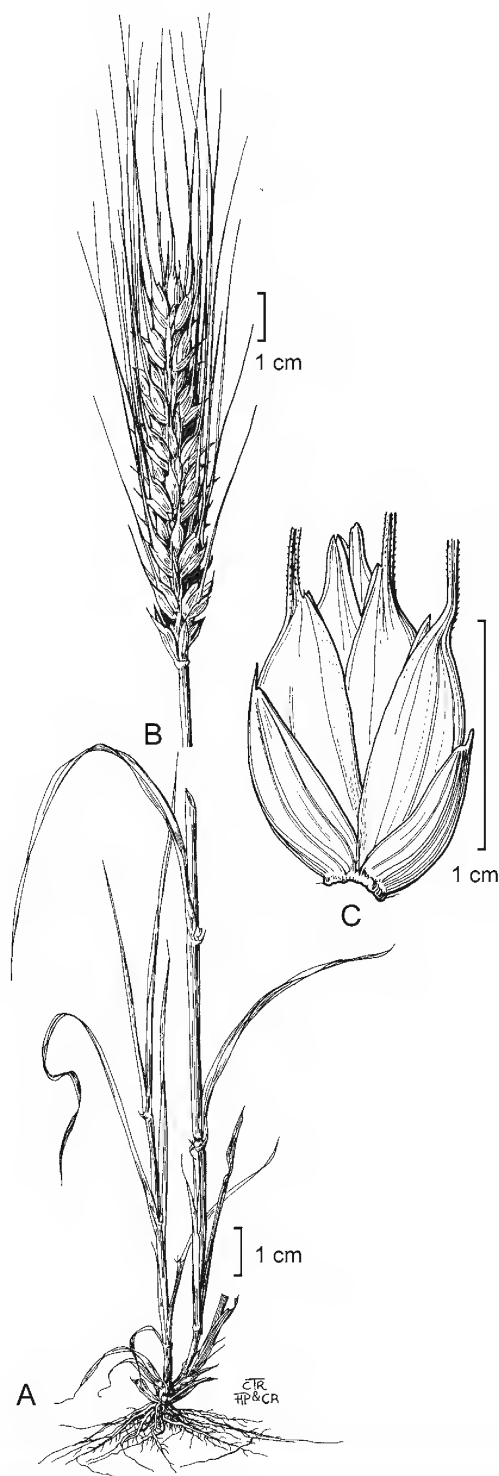


FIGURE 242. *Triticum aestivum*. A. Culm base. B. Inflorescence. C. Spikelet. Drawn by Cindy Roché, Hana Pazdírková, and Christine Roberts; copyright Utah State University.

m, *Soderstrom* 924 (US); 12 mi N of Chihuahua city on road to cd. Juárez, 14 Aug 1950, mesquite savanna, *Reeder, C. Reeder & Goodding* 1688 (ENCB); 6 mi N of Chihuahua, 8 Oct 1959, *Soderstrom* 924 (ENCB, US); La Campana Experimental Station & Rancho El Arco Iris, 81–84 km along Pan American hwy to Chihuahua City, Oct 1977, 1500 m, *J.K. Meents & W.H. Moir* 73 (NMC); La Campana, Potrero El Plan, 1 km Ote. [W] carr. Panamericana, 9 Sep 73, pastizal [pastureland], 1500 m, *Valdés-Reyna* VR-164 (RELC). **Janos:** Chihuahua–Sonora border, Rancho Carretas, 26 Aug 1939, 1460 m, *L. H. Harvey* 1601 (ENCB, US); 2 km W of Carretas, 21 Aug 1939, 1645 m, *L. H. Harvey* 1571 (ENCB, US). **Jiménez:** 8 mi N of Jiménez on Mex 45 Chihuahua, 30 Aug 1971, 4400 ft, *L. H. Harvey* 8892 (ENCB); Sierra de Santa Eulalia, 18 Jul 1939, 1400 m, *L. H. Harvey* 1532 (ENCB, US). **Meoqui:** Meoqui, 24 Aug 1935, *LeSueur* Mex-037 (US).

381. *Urochloa fusca* (Sw.) B. F. Hansen & Wunderlin, *Novon* 11(3): 368. 2001. *Panicum fuscum* Sw., *Prodr.* 23. 1788.

*Brachiaria fasciculata* (Sw.) Parodi, *Urochloa fasciculata* var. *reticulata* (Torr.) R. D. Webster.

Caespitose annual. Culms 15–120 cm tall, geniculate; nodes glabrous or shortly pilose. Sheaths glabrous or hispid, margins ciliate; ligules 1–1.5 mm long; blades 3–33 cm long, 5–20 mm wide, glabrous or sparsely pilose on both surfaces, margins smooth or scabrous; collars pubescent. Panicles 5–15 cm long, 2–8 cm wide, simple, with 5–30 raceme-like primary branches inserted in more than 2 ranks; primary branches 2–10 cm long, appressed to divergent, axils glabrous, axes 0.3–0.5 mm wide, triquetrous, scabrous or sparsely pilose; secondary branches usually present on the lower primary branches; pedicels shorter than the spikelets, scabrous and pubescent. Spikelets 2–3.4 mm long, 1.2–1.8 mm wide, obovoid, yellowish to reddish-brown or bronze-colored at maturity, mostly paired, in 2–4 rows, appressed to the branches; glumes sparsely separate, rachilla internodes short, not pronounced; lower glumes 1–1.5 mm long, at least  $\frac{1}{2}$  as long as the spikelets, glabrous, (1)3- to 5-veined; upper glumes (2)2.2–3.1 mm long, glabrous, 7- to 9-veined, cross venation evident throughout; lower florets usually staminate, sometimes sterile; lower lemmas 2–3.1 mm long, usually glabrous, 7-veined, cross venation evident throughout; lower paleas present; upper lemmas 1.8–2.9 mm long, 1.1–1.7 mm wide, apex acute to rounded, mucronate; anthers 1–1.6 mm long. Caryopsis 1–1.7 mm long; hila punctiform.  $2n = 18, 36$ .

**DISTRIBUTION AND HABITAT.** *Urochloa fusca* ranges from the southern United States to Peru, Paraguay, and Argentina; usually in moist, often disturbed areas at low elevations. It frequently occurs as a weed but is occasionally grown for forage and grain.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Ahumada:** 5 km al N de Flores Magón, 7 Oct 1995, 1220 m, *R. Corral, P. Olivas & J.O. Torres* RCD6501 (UACJ). **Batopilas:** SW Chihuahua, Aug 1885, *E. Palmer* 1-A (US); 12.3 km N of Batopilas near the Río Batopilas, 12 Sep 1989, oak forest, 800 m, *P.M. Peterson, Annable & Y. Herrera* 8059 (US).

**Camargo:** 6 mi W of Piloncillo, rd from Jimenez to Camargo, 24 Sep 1938, *I.M. Johnston* 7863 (US); Arroyo 20 km S of Cd. Camargo, 2 Aug 1939, 1220 m, *L. H. Harvey* 1391 (US); 25 mi NE of Camargo, 25 Sep 1938, *F. Shreve* 8891 (US). **Chinipas:** Sierra Saguarivo, 1.3 mi W of Curahui, 9 Sep 2008, 1001 m, *P.M. Peterson* & *J.M. Saarela* 22174 (US). **Chihuahua:** plains near Chihuahua, 2 Sep 1885, *C.G. Pringle* 379, 380 (US). **Guazapares:** W side RR tracks of Chihuahua al pacifico RR at Tacuina, 13 Aug 1967, *I.W. Knobloch* 2283 (ENCB).

382. *Urochloa meziana* (Hitchc.) Morrone & Zuloaga, *Darwiniana* 32(1–4): 68. 1993. *Brachiaria meziana* Hitchc., *Contr. U.S. Natl. Herb.* 12(3): 140. 1908.

Perennial; with short rhizomes. Culms 10–40 cm tall, branched in the inferior nodes. Sheaths pilose; ligules 0.6–1 mm long, a hairy row; blades 5–15 cm long, 5–10 mm wide, flat, rounded at the base, pilose. Inflorescence 2–5(9) cm long, 1–4 cm wide, angled, sparse with 5–10 racemes, these alternately inserted and tightly distichous, the rachis triquetrous, the racemes 1–3 cm long. Spikelets 2.7–3.6 mm long, 1.5–1.7 mm wide, solitary, glabrous, ovate-acute, with pilose pedicels; lower glumes 1–1.5(1.8) mm long, subacute, 3-veined, upper glumes 3–3.4 mm long, 5(7)-veined, rachilla internode inconspicuous; inferior lemmas equal to the upper glumes, 5-veined, ribbed on the middle part of the dorso, inferior palea translucent, widely ellipsoid; superior florets bisexual, superior lemma hardened, papillose. Caryopsis 2.4–2.6 mm long, 1.1–1.3 mm wide, ovoid.

**DISTRIBUTION AND HABITAT.** *Urochloa meziana* grows in grasslands, xerophytic scrub, and pine forests. It is known from Aguascalientes, Chihuahua, Coahuila, Colima, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Veracruz, and Zacatecas (Espejo Serna et al., 2000).

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Chihuahua:** valley near Chihuahua, 20 Sep 1885, *C.G. Pringle* 375 (US); km 71 Cd. Chihuahua–Cuauhtémoc, 27 Oct 1954, 1700 m, *Hern.-Xol.* & *C. Tapia* N-320 (US). **Guachochi:** 37.4 km S of Creel on road to Batopilas, 10 Sep 1989, pine forest, 2045 m, *P.M. Peterson*, *Annable* & *Y. Herrera* 8010 (ENCB, US). **Gran Morelos:** 10 mi W of General Trías off hwy 16, 19 Jul 1975, 5850 ft, *Ellis*, *Dunn* & *Wallace* 935 (ENCB).

383. *Urochloa plantaginea*\* (Link) R. D. Webster, *Syst. Bot.* 13(4): 607. 1988. *Brachiaria plantaginea* (Link.) Hitchc., *Contr. U.S. Natl. Herb.* 12(6): 212. 1909.

FIGURE 243

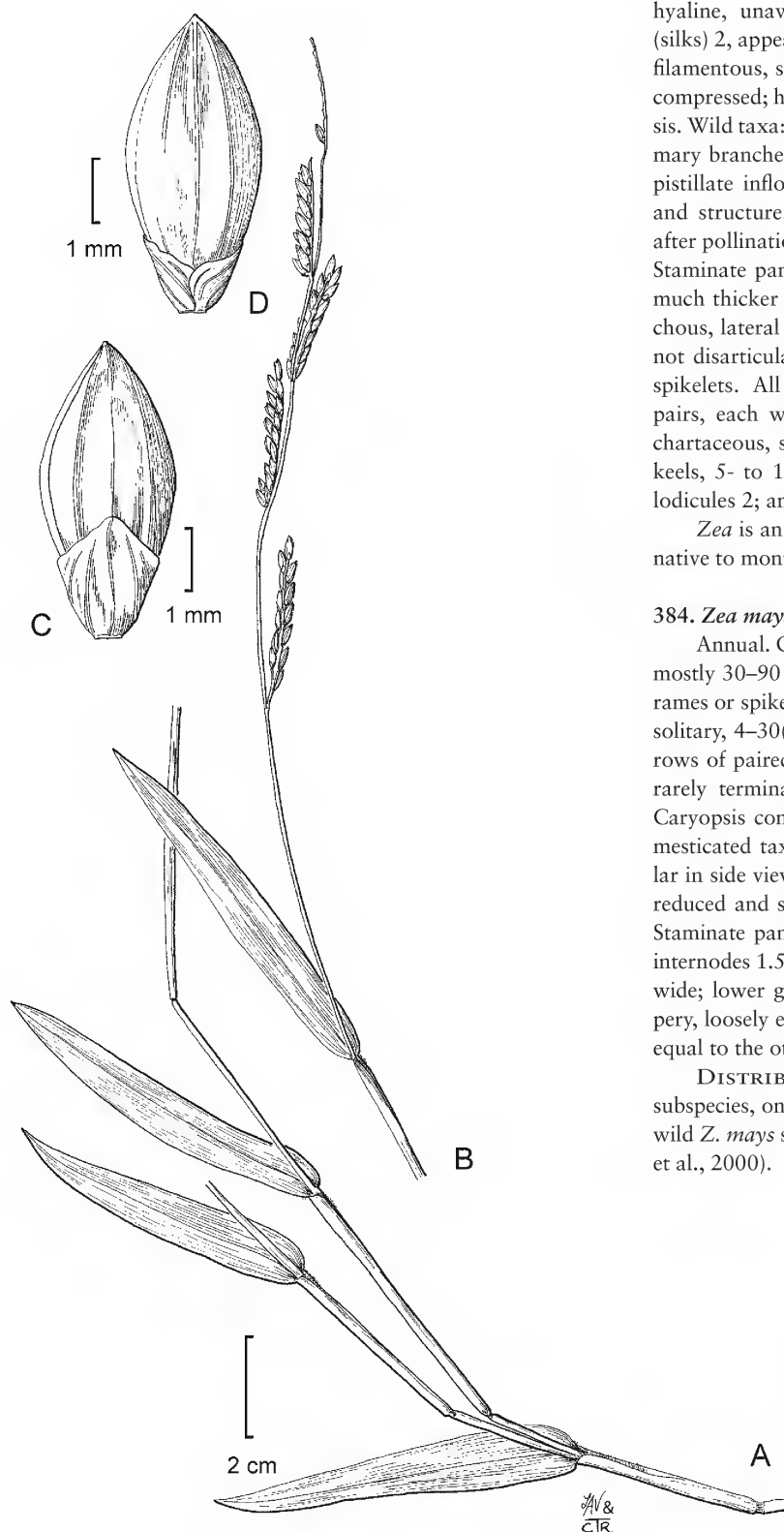
Annual. Culms 20–100 cm long, decumbent, geniculate, branching and rooting at the lower nodes; nodes glabrous. Sheaths mostly glabrous, except the margins ciliate, with papillose-based hairs; ligules 0.5–1.5 mm long; blades 3–21 cm long, 6–20 mm wide, glabrous, bases subcordate to cordate,

clasping the stems, margins sometimes ciliate basally. Panicles 6–25 cm long, 2–7 cm wide, with 3–8 racemes, these alternately inserted and distichous; primary branches 2–11 cm long, axes 1–1.5 mm wide, flat, margins scabrous; secondary branches absent; pedicels shorter than the spikelets, glabrous or scabrous. Spikelets (4)4.5–6 mm long, 1.9–2.2 mm wide, solitary, appressed to the branch axes, in 2 rows; glumes separated by an internode of about 0.5 mm; lower glumes 1.5–2.5 mm long, about ½ as long as the spikelets, broadly ovate, glabrous, 9- to 11-veined; upper glumes 3–4.2 mm long, glabrous, 7(9)-veined, without evident cross venation; lower florets sterile; lower lemmas 3–4.2 mm long, glabrous, 5-veined; lower paleas present; upper lemmas 2.7–3.6 mm long, 1.5–2 mm wide, apex rounded; anthers 0.7–1 mm long. Caryopsis 2–2.5 mm long.  $2n = 36, 72$ .

**DISTRIBUTION AND HABITAT.** *Urochloa plantaginea*, native to western and central Africa, is found from the southern United States to Argentina. It is now established in the southeastern United States and northern Mexico, growing in loose sand and loamy soils. This species has been reported in Chihuahua (Espejo Serna et al., 2000).

## Zea L.

Annual or perennial; monoecious, inflorescences unisexual or bisexual with the pistillate spikelets basal and the staminate spikelets distal. Culms solitary or several to many together, monopodial, often branching (branches frequently highly reduced and hidden within the subtending leaf sheath), usually succulent when young, becoming woody with age; lower nodes with prop roots; internodes pith-filled. Leaves not aromatic, cauline, distichous; sheaths open; auricles sometimes present; ligules membranous, shortly ciliate; blades flat. Pistillate or partially pistillate inflorescences terminal on axillary branches; staminate inflorescences (tassels) paniculate, of 1 to many branches or rames, sometimes with secondary and tertiary branching. Wild taxa: Pistillate inflorescences solitary, distichous rames (ears), these often tightly clustered in false panicles, each usually wholly or partially enclosed by a thin prophyll and an equally thin bladeless leaf sheath; rames composed of 5–15 spikelets in 2 ranks; disarticulation in the rame axes, dispersal units (fruit cases) consisting of an indurate, shiny rame segment and its embedded spikelet. Pistillate spikelets solitary, sessile, with 1 floret; pedicels and pedicellate spikelets suppressed; lower glumes exceeding the floret, indurate on the central, exposed portion, hyaline on the margins, concealing the caryopsis at maturity. Domesticated taxon: Pistillate inflorescences solitary, polystichous spikes (ears) terminating reduced branches, each spike surrounded by several to many, often bladeless leaf sheaths and a prophyll (husks), with 60–1000+ spikelets in 8–24 rows, neither spikes nor spikelets disarticulating at maturity. Pistillate spikelets in subsessile pairs, each spikelet with 1 functional floret; glumes shorter than the spikelets, indurate basally, hyaline distally; lower florets suppressed. All taxa: lemmas and paleas



hyaline, unawned; lodicules absent; ovaries glabrous; styles (silks) 2, appearing solitary by being fused except at the very tip, filamentous, sides stigmatic. Caryopsis subspherical to dorsally compressed; hila round; embryos about  $\frac{2}{3}$  as long as the caryopsis. Wild taxa: Staminate panicles terminal on the culms and primary branches, sometimes also on the secondary branches and pistillate inflorescences; rames distichous, similar in thickness and structure, axes disarticulating below the sessile spikelets after pollination, abscission layers evident. Domesticated taxon: Staminate panicles terminal on the culms, central axes always much thicker than the lateral branches and irregularly polystichous, lateral branches distichous to more or less polystichous, not disarticulating, without abscission layers below the sessile spikelets. All taxa: Staminate spikelets in sessile-pedicellate pairs, each with 2 staminate florets; glumes membranous to chartaceous, stiff to flexible, sometimes with a pair of winged keels, 5- to 14(28)-veined, acute; lemmas and paleas hyaline; lodicules 2; anthers 3.  $\times = 10$ .

*Zea* is an American genus of five species, four of which are native to montane Mexico and Central America.

**384. *Zea mays* L., Sp. Pl. 2: 971–972. 1753.**

Annual. Culms (0.5)1–3(6) m tall, (0.5)1–5 cm thick. Blades mostly 30–90 cm long, 2.5–12 cm wide. Pistillate inflorescences rames or spikes, usually shortly pedunculate (sometimes sessile), solitary, 4–30(40) cm long, (0.5)1–10 cm thick, with 2 or more rows of paired spikelets, hence the spikelets 4 or more ranked, rarely terminating in an unbranched staminate inflorescence. Caryopsis concealed in fruit cases (wild taxa) or exposed (domesticated taxon); fruit cases of wild taxa distichous, triangular in side view; domesticated taxon without fruit cases, glumes reduced and shallow or collapsed and embedded in the rachis. Staminate panicles 10–25+ cm long, with 1–60(235) branches, internodes 1.5–8.2 mm long; spikelets 9–14 mm long, 2.5–5 mm wide; lower glumes rounded dorsally, flexible, translucent, papery, loosely enclosing the upper glumes, the 2 lateral veins subequal to the others, not winged.  $2n = 20$ .

**DISTRIBUTION AND HABITAT.** *Zea mays* has five subspecies, only the domesticated *Z. mays* subsp. *mays*, and the wild *Z. mays* subsp. *mexicana* grow in Chihuahua (Espejo Serna et al., 2000).

**FIGURE 243. *Urochloa plantaginea*.** A. Habit. B. Inflorescence. C. Spikelet showing lower glume. D. Spikelet showing upper glume. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

KEY TO SUBSPECIES OF *ZEA MAYS*

1. Pistillate inflorescences cylindrical spikes, 2–5(10) cm thick, with 8–24+ rows of spikelets pairs, each inflorescence tightly and permanently enclosed by several leaf sheaths and a large prophyll, not disarticulating at maturity; caryopsis 60–1000+, not concealed by the glumes; staminate panicle branches not disarticulating below the sessile spikelets, lacking abscission layers; central axis of the staminate panicles polystichous, much thicker than the lateral branches; obligate domesticated ..... *Z. mays* subsp. *mays*
1. Pistillate inflorescences cylindrical, distichous rames, less than 1 cm thick, with 2 rows of spikelet pairs, each rame usually enclosed by a single leaf sheath and a prophyll, disarticulating at maturity into fruit cases; caryopsis 4–15, each one concealed within a fruit case; staminate panicles composed of rames that disarticulate below the sessile spikelets and have evident abscission layers; central axis of the staminate panicles similar in width to the rames; wild ..... *Z. mays* subsp. *mexicana*

*Zea mays* L. subsp. *mays*

FIGURE 244

**DISTRIBUTION AND HABITAT.** Known from Canada, United States, Mexico, Central and South America, and the Caribbean.

*Zea mays* subsp. *mexicana* Iltis, Annual Rev. Genetics 5: 450. 1971.

FIGURE 245

**DISTRIBUTION AND HABITAT.** Known from Mexico in Chihuahua, Distrito Federal, Durango, Guanajuato, Guerrero, Jalisco, Michoacán, Nuevo León, Oaxaca, Puebla, and Querétaro.

### *Zuloagaea* Bess

Perennial; caespitose, rhizomatous, rhizomes short, thin. Culms clumped or solitary, often with hard, cormlike bases, slightly compressed, erect or geniculate at the lower nodes. Sheaths shorter than the internodes, keeled, often pilose, hairs papillose-based near the throat; ligules membranous-based, ciliate; blades flat, adaxial surfaces scabrous. Panicles pyramidal, open, bearing 4–40 branches, basal node with 1 branch; primary branches with 3–6 orders of branching, straight or flexible, ascending to reflexed; pedicels scaberulous, divergent. Spikelets ellipsoid or lanceoloid, purplish or greenish, glabrous, acute or obtuse; lower glumes about  $\frac{2}{3}$  as long as the upper glumes, 3- to 5-veined; upper glumes slightly shorter to subequal to the lower lemmas, glabrous, 5- to 7-veined; lower florets sterile or staminate; lower lemmas glabrous, 5-veined, acute; lower paleas 3–4 mm long, hyaline; upper florets exceeding the upper glumes, margins embracing the lower lemmas, dull, pale, finely transversely rugose, apex acute, puberulent; anthers yellow-brown; stigmas pale purple, plumose. Caryopsis oblong, compressed, embryos about  $\frac{1}{3}$  the length of the caryopsis.  $x = 9$ .

*Zuloagaea* is a monotypic genus that is native to western North America.

385. *Zuloagaea bulbosa* (Kunth) E. Bess, Syst. Bot. 31: 656–670. 2006. *Panicum bulbosum* Kunth, Nov. Gen. Sp. (quarto ed.) 1: 99. 1815.

FIGURE 246

**Culms** 20–200 cm tall, 1–8 mm thick, erect or geniculate at the lower nodes; nodes glabrous or pilose; internodes glabrous. Sheaths shorter than the internodes, keeled, glabrous or pilose, hairs near the throat papillose-based; ligules with a 0.1–2 mm long membranous base and 0.10–3 mm long ciliate fringe; blades (6)20–75 cm long, 1.5–15 mm wide. Panicles 9–75 cm long, width to about  $\frac{2}{3}$  length; branches straight or flexible, strongly ascending to reflexed; pedicels 0.2–5 mm long. Spikelets 2.5–5.5 mm long, 1–2 mm wide; lower glumes 1.2–3.5 mm long,  $\frac{1}{2}$ – $\frac{4}{5}$  as long as the spikelets, 3- to 5-veined; upper glumes 1.4–4 mm long; lower florets sterile or staminate; lower lemmas 2.9–3.3 mm long; upper florets 2.1–5 mm long, 1–1.5 mm wide, lemma apex puberulent.  $2n = 36, 54, 70, 72$ .

**DISTRIBUTION AND HABITAT.** *Zuloagaea bulbosa* grows in roadside ditches and on gravelly river banks and moist mountain slopes, often in pine-oak forests. It is found from southern Nevada and Arizona to west Texas and central Mexico.

**SPECIMENS EXAMINED.** MEXICO. Chihuahua. **Balleza:** 15 mi E of El Vergel on road to Parral, 21 Oct 1959, on pine-oak slope of mountain, 7500 ft, D.S. Correl & Gentry 23261 (ENCB); 56.4 km W of Parral on road to Balleza and 35.5 km S of Balleza on Mex 432, near Corral de Duarte, 18 Sep 1991, bosque de pino-encino [pine-oak forest], 2210 m, P.M. Peterson, Annable & Valdés-Reyna 10724 (CIIDIR); 3 km al S de Agua Blanca, 27 Jul 1986, bosque de pino, 2500 m, H. Cota 7287 (ENCB). **Batopilas:** Yamuco at 1 km E of hwy towards Basihuare and Creel, N of Río Urique crossing, 26 Aug 2003, pine-oak forest, 1891 m, P.M. Peterson & P. Catalán 17538 (CIIDIR). **Bocoyna:** 24.7 mi N of San Juanito on road towards Cuauhtemoc, 5 Sep 2008, 2233 m, P.M. Peterson & J.M. Saarela 22030 (US). **Buenaventura:** San Buenaventura, 9 Sep 1975, *Quercus emoryi* dominte, 1850 m, J. Passini & M.F. Robert 6583 (ENCB). **Chihuahua:** near Chihuahua, 7 Aug 1885, C.G. Pringle 377 (US); La Campana 4 km W carr [hwy] panamericana, 5 Sep 1973, pastizal amacollado con encino [grass pasture with oak],



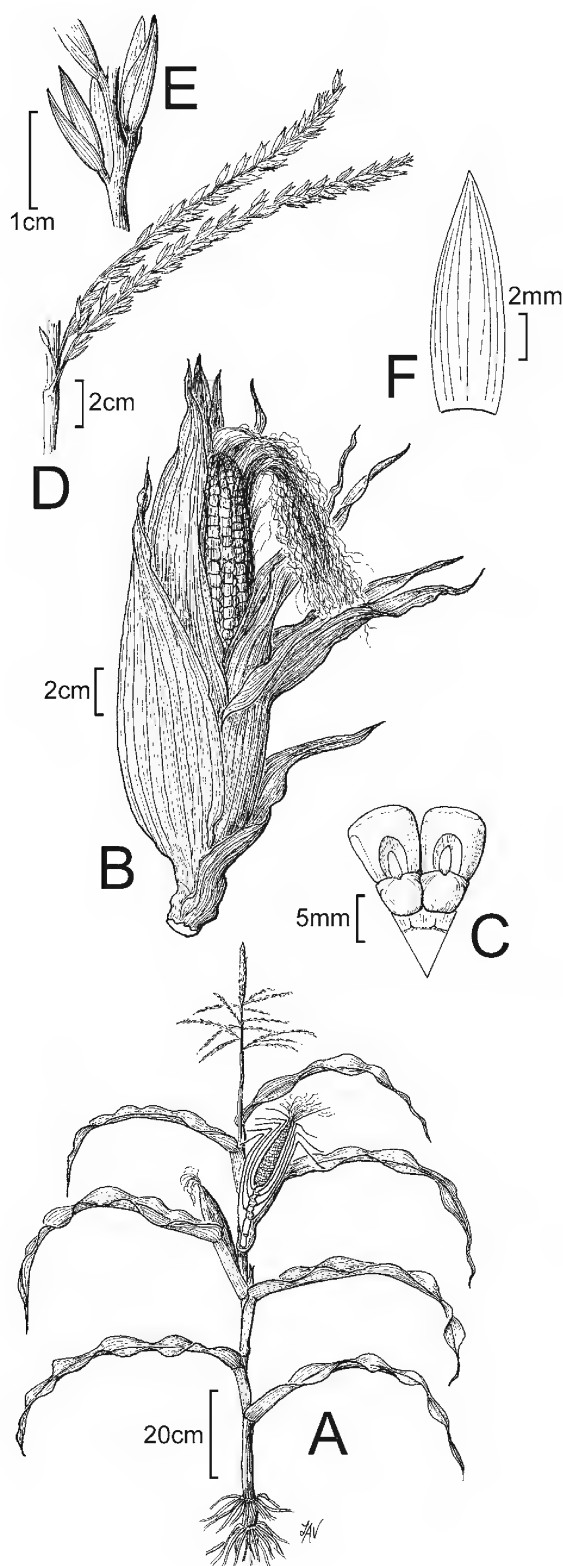


FIGURE 244. *Zea mays* subsp. *mays*. A. Habit. B. Pistillate spike. C. Pistillate spikelet pair. D. Staminate branches. E. Staminate spikelets. F. Staminate lower glume. Drawn by Linda Ann Vorobik; copyright Utah State University.

1700 m, *Valdés-Reyna* VR-87 (ENCB, RELC); Rancho La acampana, 82 km al N de la cd. de Chihuahua, 26 Aug 1978, jardines de observación [observation gardens], 1550 m, C.A. *Fernández s.n.* (ENCB). **Guachochi:** 8 km al W de Cabóachi, 12 Aug 1982, bosque de pino-encino, 2100 m, R. *Hernández* 8754 (CIIDIR); along Río Corareáchi, 30 Aug 2003, slopes with *Quercus* spp., *Cupressus*, *Arbutus*, and *Juniperus*, 1840–1900 m, P.M. *Peterson* & P. *Catalán* 17598 (CIIDIR, US); 24.6 km S of Mex 127 and 11.1 km NE of La Bufa, 11 Sep 1989, oak forest, 2000 m, P.M. *Peterson*, *Annable* & Y. *Herrera* 8051 (ENCB, US); 8 km al W de Cabóachi, 12 Aug 1982, bosque de pino-encino, 2100 m, A. *Carrillo* 2001 (CIIDIR); entre [between] Creel & San Rafael, 14 Aug 1976, bosque de pino-madroño-encino, 2501 m, S. *González* & J.M. *Peña* 683 (RELC). **Guadalupe y Calvo:** Mt. Mohinora, SW Chihuahua, 1 Sep 1898, E.W. *Nelson* 4901 (US). **Guerrero:** 32.3 km SW of La Junta on road to Creel, 10 Sep 1989, pine forest, 2310 m, P.M. *Peterson*, *Annable* & Y. *Herrera* 7987 (ENCB, US); 38.6 km SW of La Junta and approx. 70.8 km N of Creel at p. Arroyo Ancho crossing, 21 km marker, 24 Sep 1988, pine woods, 2200 m, P.M. *Peterson* & *Annable* 5855 (ENCB, US); entre Cuauhtémoc & La Junta, 12 Aug 1976, bosque de encino, 2185 m, S. *González* & J.M. *Peña* 562 (ENCB). **Ignacio Zaragoza:** Ejido de León, 12 Sep 1975, 2100 m, J. *Passini* & M.F. *Robert* 6701, 6723 (ENCB). **Janos:** Chihuahua–Sonora Border, Rancho Carretas, 27 Aug 1939, 1460 m, L. H. *Harvey* 1616 (US). **Madera:** Arroyo de la Quinta, ejido “El Largo”, 30 Aug 1990, bosque de pino, 2340 m, A. *Benítez* 2088 (CIIDIR); Proximidad a la Col. Chuichupa, 1 Sep 1990, bosque de junipero [juniper grove], 2240 m, A. *Benítez* 2166 (CIIDIR); Mesa de Tenuñes, ejido El Largo, 20 Aug 1990, bosque de encino, 2120 m, O. *Bravo* 1170 (CIIDIR); Mesa del Yerbánis, ejido El Largo, 12 Oct 1990, bosque de *Quercus*, 1900 m, O. *Bravo* 1840 (CIIDIR); Puerto del Tenedor, ejido El Largo, 21 Aug 1990, bosque de pino-encino, 2450 m, O. *Bravo* 1206 (CIIDIR); La Tinaja, ejido El Largo, 29 Aug 1990, bosque de encino-pino, 1840 m, O. *Bravo* 1350 (CIIDIR); Near Col. García in the Sierra Madre, 5 Aug 1899, 2300 m, C.H.T. *Townsend* & C.M. *Barber* 221 (NMC); Laguna de Babicora, alrededores [around] de Nicolás Bravo, 18 Aug 1994, 2200 m, *Quintana*, *Lebgue* & *Estrada* 3141 (NMC). **Matamoros:** 4 mi SW of Villa Matamoros, 5 Oct 1959, 6000–6300 ft, *Correll* & *Gentry* 22821 (ENCB). **Ocampo:** Parque Nacional “Cascada de Basaseachic”, 1 Aug 1988, Sandy pockets in rocks, 2000 m, *Spellenberg*, R. *Corral*, J. *Brunt* & L. *Huemeke* 9617 (CIIDIR); Pinos Altos, 13 km



FIGURE 245. *Zea mays* subsp. *mexicana*. A. Habit. B. Pistillate branches. C. Fruit case, ventral view. D. Fruit case, lateral view. E. Staminate branch. F. Staminate lower glume. Drawn by Linda Ann Vorobik; copyright Utah State University.

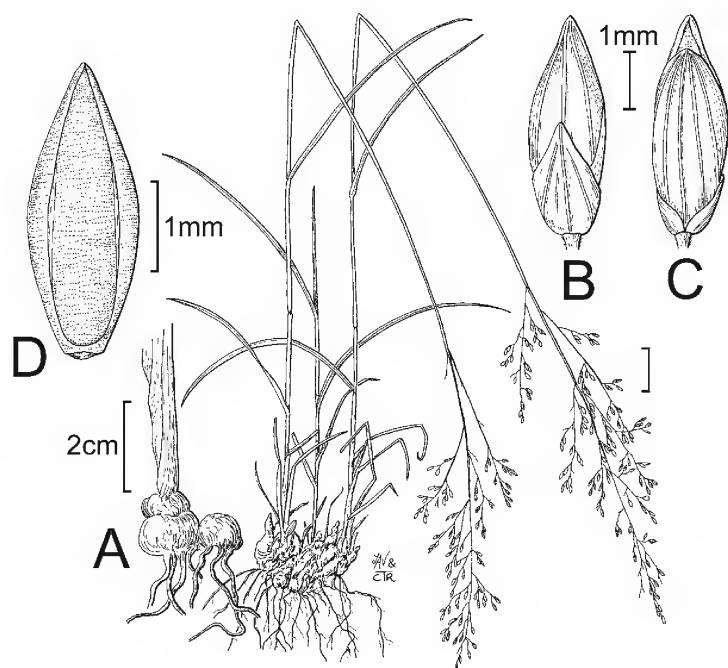
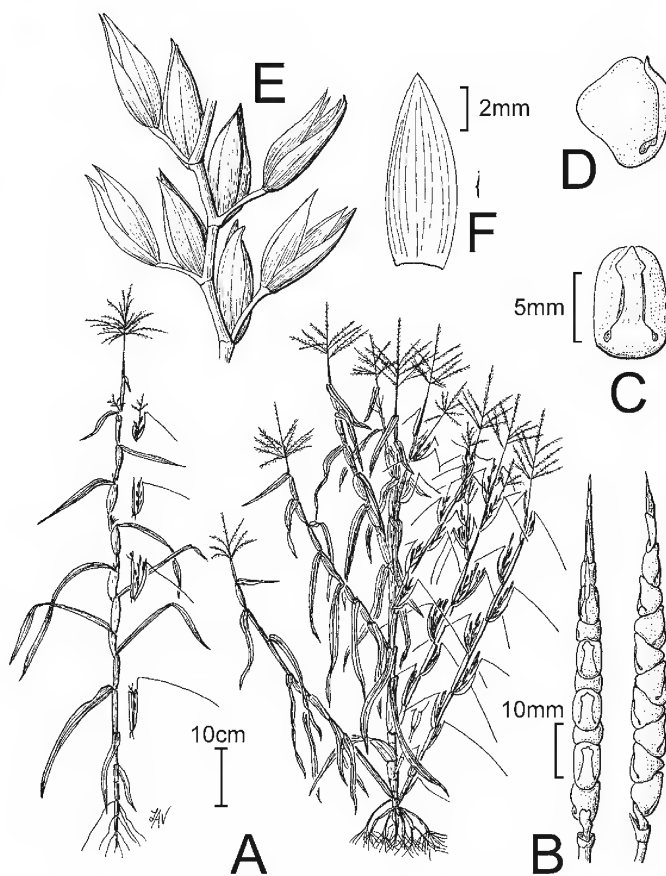


FIGURE 246. *Zuloagaea bulbosa*. A. Habit. B. Spikelet showing lower glume. C. Spikelet showing upper glume. D. Upper floret, ventral view. Drawn by Linda Ann Vorobik and Cindy Roché; copyright Utah State University.

al O de Basaseachic, 9 a 12 oct 1977, bosque de pino-encino, entre 1700 & 2000 m, *J.D. Tejero & A. Muños* 3982 (CIIDIR); Parque Nacional Cascada de Basaseachic, 100 m upstream from the top of the falls along the Rio Basaseachi, 1 Aug 1988, 2000 m, *Spellenberg, R. Corral, J Brunt & L. Huenneke* 9617 (NMC); Parque Nacional "Cascada de Basaseachic," at overlook ca. 1 km airline S of Cascada, 3 Oct 1986, 2100 m, *Spellenberg, Soreng, R. Corral & T. Lebgue* 8651 (NMC); Parque Nacional Cascada basaseachic, por la vereda que va de la parte alta de la cascada [along the path from the top of the waterfall] a

"La Ventana", 22 Sep 1994, bosque de pino-encino, 1980 m, *R. Corral, Spellenberg & E. Estrada* RCD5448 (UACJ). **Riva Palacio:** Majalca (Pilares), 11 Aug 1939, 2075 m, *L. H. Harvey* 1451 (ENCB); Col. Cumbres de Majalca, 33.8 km W of Mex 45, N of Chihuahua City, 7 Sep 1989, pine forest, 2190 m, *P.M. Peterson, Annable & Y. Herrera* 7961 (ENCB, US). **Temosachi:** Nabogame, 7 Sep 1987, 1800 m, *LaFerr.* 1025 (NMC). **Urique:** 225 air km SW of Cd. Chihuahua on the Rio Batopilas, 5 km downstream from the bridge at La Bufa, 19 Oct 1986, 1160 m, *Spellenberg & N. Zucker* 8929 (NMC).



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